NAVAL SHIPS' TECHNICAL MANUAL

CHAPTER 077

PERSONNEL PROTECTION EQUIPMENT

THIS CHAPTER SUPERSEDES CHAPTER 077 DATED 1 MAY 1992

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL SEA SYSTEMS COMMAND.

26 MAR 1998

NAVSEA TECHNICAL MANUAL CERTIFICATION SHEET 1 of 1

Certification Applies to: New Manual ☐ Revision ☒ Change ☐

Applicable TMINS/Pub. No. S9086-CL-STM-010/CH-077R3

Publication Date (Mo, Da, Yr) March 26, 1998

Title: NSTM Chapter 077, Personnel Protection Equipment

TMCR/TMSR/Specification No:

CHANGES AND REVISIONS:

Purpose:
To incorporate general revision to update technical manual.

Equipment Alteration Numbers Incorporated:

TMDER/ACN Numbers Incorporated:

Continue on reverse side or add pages as needed.

CERTIFICATION STATEMENT

This is to certify that responsible NAVSEA activities have reviewed the above identified document for acquisition compliance, technical coverage, and printing quality. This form is for internal NAVSEA management use only, and does not imply contractual approval or acceptance of the technical manual by the Government, nor relieve the contractor of any responsibility for delivering the technical manual in accordance with the contract requirement.

Authority	Name	Signature	Organization	Code	Date
Acquisition	Dennis McCrory	Dennis McCrory	NAVSEA	03G1	3/26/98
Technical	Dennis McCrory	Dennis McCrory	NAVSEA	03G1	3/26/98
Printing Release	Digital Media Publishing				

Certification Sheet

TABLE OF CONTENTS

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS - Continued

CHAPTER 77

PERSONNEL PROTECTION EQUIPMENT

SECTION 1.
INTRODUCTION

077-1.1 SCOPE

077-1.1.1 This chapter provides information for the use and care of the following groups of personnel protection equipment:

a. Life preservers

b. Breathing apparatus and equipment

c. Firefighting clothing

d. Anti-flash and steam clothing

077-1.1.2 Specialized personnel protection equipment, for specific functions and materials, is covered in other NSTM chapters as indicated in Table 077-1-1.

Table 070-1-1. REFERENCES

Equipment	NSTM Chapter
Welding	074, Volume 1
High pressure hydraulic oil	262
Chemical, biological, and radiological	470 and 070
Sewage handling	593
Oil spill cleanup	593
Asbestos handling	635
Chemical handling	631 and 670

077-1.1.3 Information presented in this chapter supersedes previous versions of this chapter and other previously published instructions on how to don, wear, and care for personnel protection equipment. Information on when and how to employ personnel protection equipment is contained in **NSTM Chapter 555, Volume 1, Surface Ship Firefighting; NSTM Chapter 555, Volume 2, Submarine Firefighting; NSTM Chapter 079, Volume 2, Damage Control - Practical Damage Control; NSTM Chapter 074, Volume 3, Gas Free Engineering** ; Ship's Damage Control Book; Type Commander Instructions; and Type Commander Repair Party Manual.

077-1.1.4 Nothing in this manual is intended to preclude the good judgment and common sense of the on-scene commander.

SECTION 2.
LIFE PRESERVERS

077-2.1 INTRODUCTION

077-2.1.1 This section covers the following life preservers used by the Navy:

a. Inherently buoyant life preservers -
   1 Vest Type with Collar, Type I (also called the kapok life preserver)
   2 Vest Work Type
   3 Yoke Type (also called the assault life preserver)

b. Inflatable life preservers -
   1 MK 1 Vest Type
   2 Abandon-Ship Type with Pouch (LPP-1)
   3 Auto-Inflatable Utility Life Preserver (AIULP)

077-2.1.2 Each life preserver is described along with its intended purpose. Directions are provided for use and care. The intended purpose of each life preserver discussed in this section is summarized in Table 077-2-1. Life preserver accessories are discussed, including directions for their use and care, starting in paragraph 077-2.6. Required accessories for each life preserver are listed in Table 077-2-2.

Table 077-2-1. LIFE PRESERVER REFERENCE

Life Preserver Type	Life Preserver Uses
Inherently Buoyant Vest Type with Collar, Type I	All shipboard evolutions EXCEPT: 1. Flight Deck operations
Inherently Buoyant Vest Work Type	Work parties ashore and in protected waters
Inherently Buoyant Yoke Type MIL-L-850	Troops (amphibious operations)
Inflatable MK 1 Vest Type MIL-L-24247 or CS-4220-SS-0004	All shipboard evolutions EXCEPT: 1. Performance of hot work or other activity which may damage the life preserver 2. Personnel riding aircraft
Inflatable LPP-1 Abandon-Ship Type with Pouch (Orange) MIL-L-15581	1. General quarters 2. Abandon ship operations 3. Personnel riding aircraft
Inflatable Abandon-Ship Type with Pouch (Gray) MIL-L-15581	Marine helicopter assault operations
Auto-Inflatable Utility Life Preserver (AIULP), NAVSEA Technical Manual SS710-AB-MMO-010	1. Personnel handling lines or other deck equipment during transfer between ships, fueling at sea (FAS), towing, boat hoisting or lowering, and heavy weather 2. Topside work parties 3. Underway replenishment work parties 4. Topside watch parties 5. Over-the-side work parties

Table 077-2-2. ACCESSORY EQUIPMENT ON LIFE PRESERVERS

Preserver Type	Reflective Tape	Whistle See Note 1	Distress Marker Light See Note 2	Sea-Dye Marker	Toggle Line (Buddy Line)
Inherently Buoyant Life Preservers:					
Vest Type With Collar Type 1	Yes	Yes	Yes	Yes See Note 3	No
Vest Work Type	Yes	No	No	No	No
Yoke Type	No	No	No	No	No
Inflatable Life Preservers:					
MK 1 Vest Type	Yes	Yes	Yes Note 4	Yes Notes 5 & 6	No
Abandon-Ship Type (Orange)	Yes	Yes	Yes	Yes Note 5	Yes See Note 7
Abandon-Ship Type (Gray)	No	No	No	No	No
AIULP	Yes	Yes	Yes Note 8	Yes Note 5	Yes Note 8

NOTES
1. The MK 1 vest type life preserver and the AIULP use a flat whistle. The other life preservers use either the flat whistle or the plastic police-type whistle. Whistles shall be attached to life preservers by lanyards secured with a bowline knot.
2. Personnel Marker Lights can be used in place of distress marker lights on life preservers requiring distress marker lights.
3. The sea-dye marker shall be attached to the left (non-adjustable) chest strap. See paragraph 077-2.2.2.1.2.
4. The MK 1 vest type life preserver is equipped with a mercury strobe Type SDU-5E distress marker light.
5. The sea-dye marker shall be attached to the life preserver or the life preserver belt with a 48-inch lanyard tied with a bowline knot.
6. The sea-dye marker shall be attached to the MK 1 vest type life preserver only if a pouch is provided on the vest for its stowage.
7. A 48-inch toggle (buddy) line shall be tied to the life preserver belt with a bowline knot if a suitable toggle line is not supplied by the manufacturer.
8. See the AIULP technical manual (SS710-AB-MMO-010) for a description of its distress marker light. A buddy line comes attached as part of the AIULP.

077-2.2 INHERENTLY BUOYANT LIFE PRESERVERS

077-2.2.1 TYPES. The three types of inherently buoyant life preservers are:

a. Vest Type with Collar, Type I (also called the kapok life preserver)

b. Vest Work Type

c. Yoke Type (also called the assault life preserver)

077-2.2.1.1 Inherently buoyant life preservers use plastic foam or fibrous glass flotation pads to provide the required buoyancy. The pads are contained in a vest or yoke style cover. The materials for the flotation pads are described in paragraph 077-2.2.5.

077-2.2.2 VEST TYPE WITH COLLAR, TYPE I. This life preserver provides the wearer 30 pounds of buoyancy and is self righting. The buoyancy and self righting capability will keep an unconscious wearer's head face up and out of the water while awaiting rescue.

077-2.2.2.1 Construction. The inherently buoyant type I life preserver is illustrated in Figure 077-2-1 with its major components and accessories identified. The vest type life preserver consists of a cotton cover which encloses removable plastic foam or fibrous glass flotation pads. There are four pads in the front sections, one in the back, and one in the collar. The pads are removable through zipper openings to permit laundering of the cover.

077-2.2.2.1.1 Collar straps, upper front straps, and waist drawstrings are provided for securing the life preserver. Adjustable leg straps are fitted on both sides of the life preserver to prevent it from riding up on the wearer when in the water. An adjustable chest strap is provided to secure the life preserver to the wearer when entering the water. This strap can also be attached to other survivors or to lifeboats to eliminate fatigue resulting from holding on by hand.

077-2.2.2.1.2 Reflective tape is sewn to the cover on the front, back, and collar. Details for attaching reflective tape to the cover are discussed in paragraph 077-2.5.5. Ship's force shall stencil the ship's name and hull number on the back of each life preserver in 2-inch high, black, block letters. A loop is provided on the left shoulder of the life preserver for attachment of the distress marker light or personnel marker light (PML) and the whistle lanyard. The sea-dye marker should be attached to the life preserver by tying it around the left (non-adjustable) chest strap so the marker lies under the left arm when the life preserver is worn. See Figure 077-2-1 for placement of life preserver accessories.

077-2.2.2.2 Donning and Adjusting. Procedures for donning and adjusting the life preserver are as follows:

1. Ensure whistle, distress marker light or PML (or both), and sea-dye marker are on the life preserver.

WARNING

Always wear the life preserver leg straps to ensure life preserver provides proper flotation.

2. Straighten leg straps and pass them through the D-rings located on the bottom of life preserver. Fully extend straps.
3. Step through leg straps and bring life preserver up over shoulders. Ensure leg straps are not twisted.
4. Cross collar straps and pass them through the metal D-rings on the vest cover. When the life preserver is worn, the D-rings will be located near the throat. Pull the collar straps snugly through the D-rings, and secure them with a bow knot. This is illustrated in Figure 077-2-2.
5. Pull the upper front straps snugly and secure them with a bow knot, as shown in Figure 077-2-2. The upper front straps are located right below the D-rings. Do not pass these straps through the D-rings.
6. Pull the waist drawstrings tight and secure them with a bow knot, as shown in Figure 077-2-2.
7. Stow the whistle inside the life preserver.
8. Secure the chest strap, as shown in Figure 077-2-2. Ensure strap is not twisted and tighten strap.

9. Tighten leg straps, as shown in Figure 077-2-3.

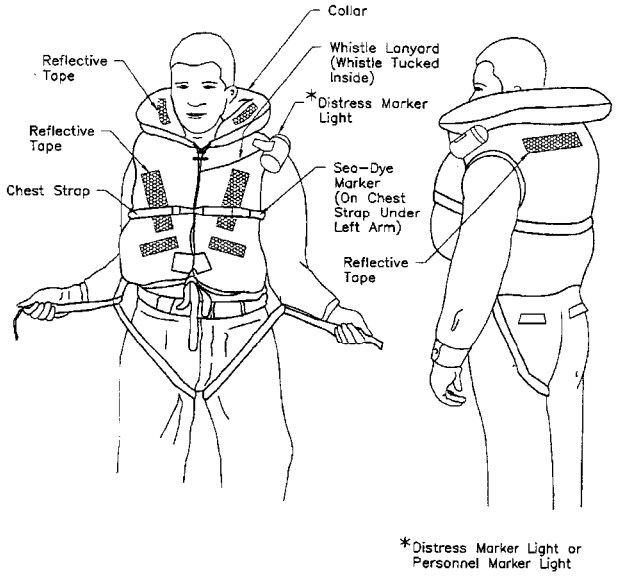


Figure 077-2-1. Inherently Buoyant Vest Type Life Preserver with Collar

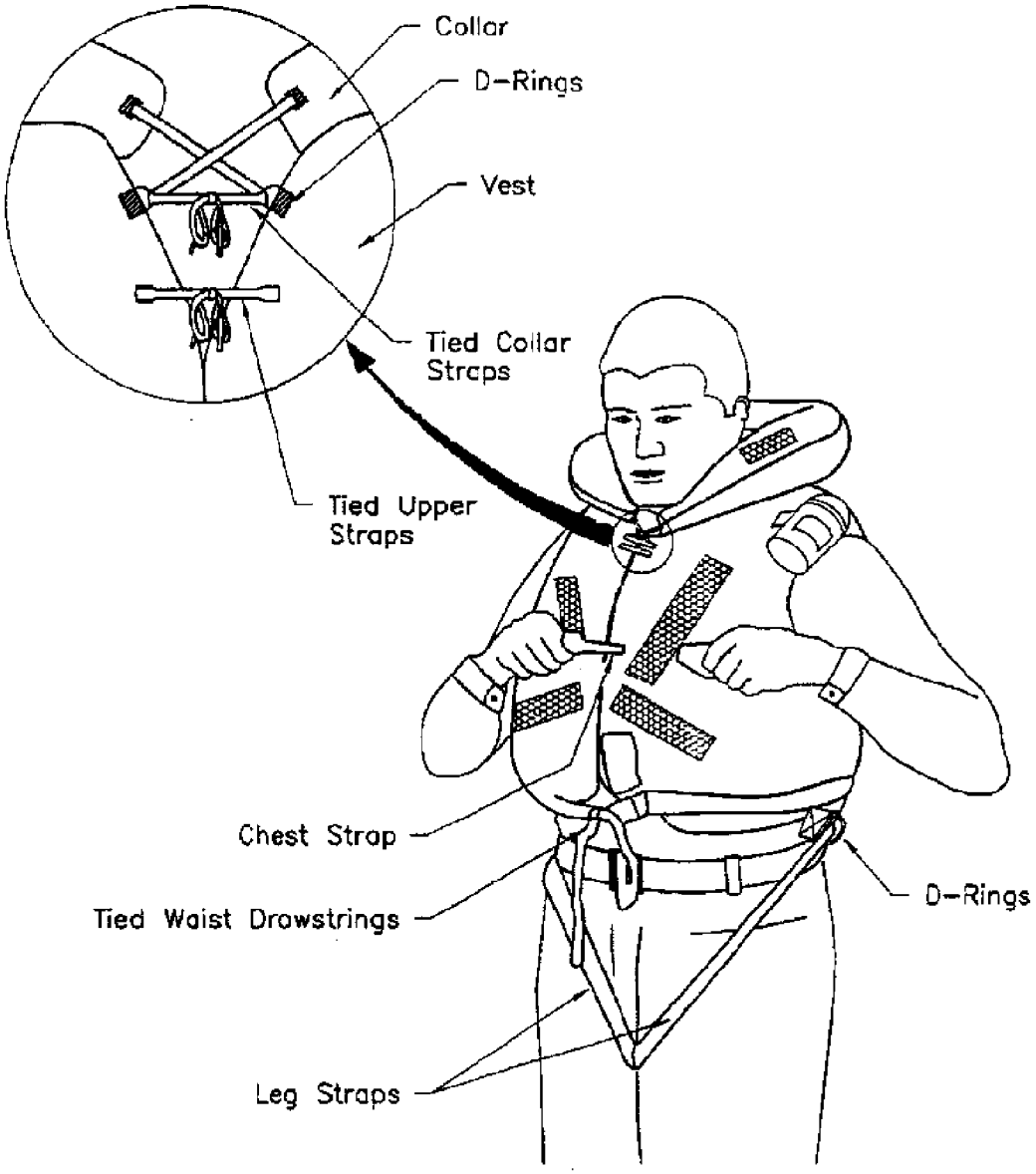


Figure 077-2-2. Securing Vest Type Life Preserver

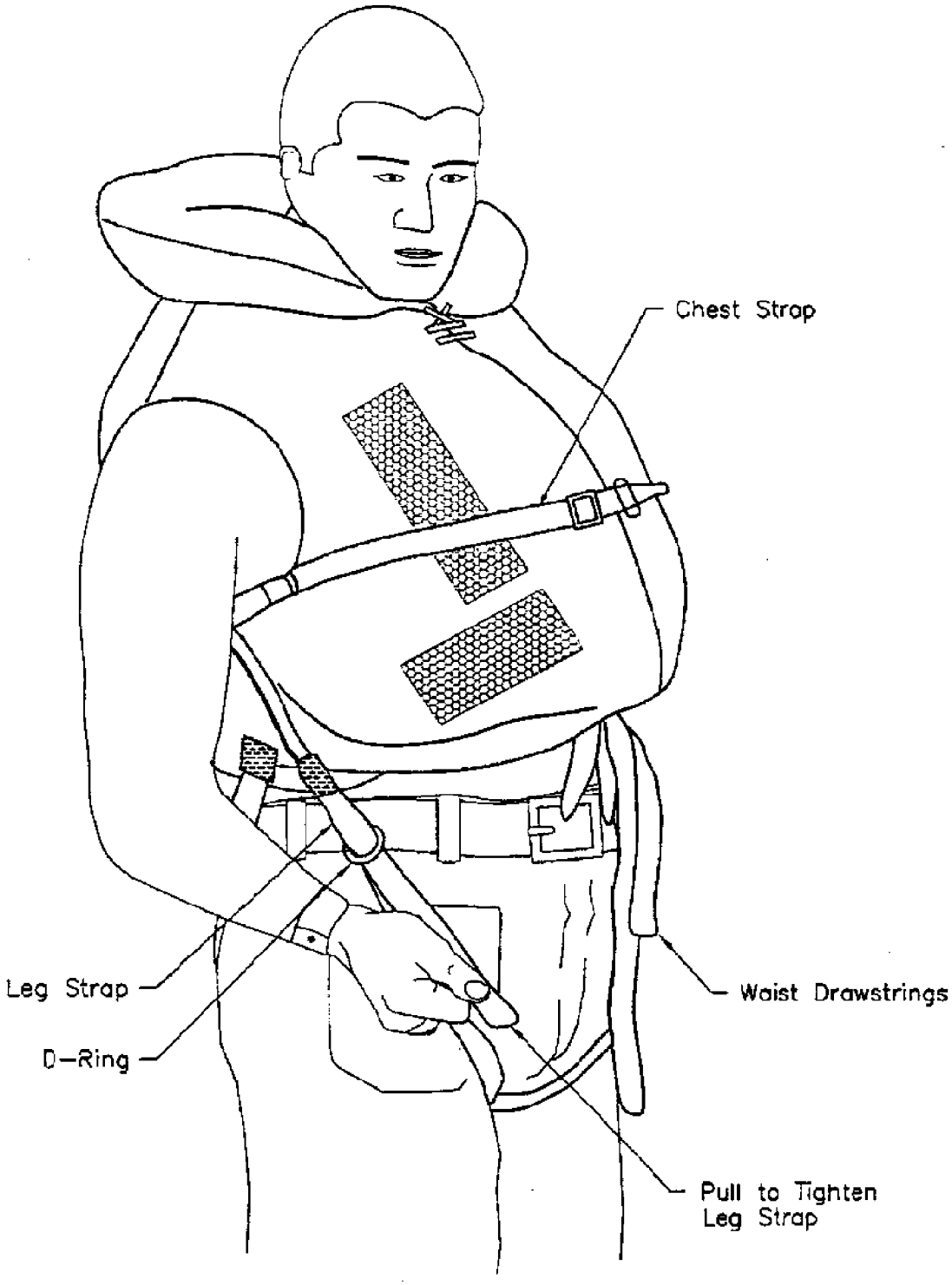


Figure 077-2-3. Vest Type Leg Strap Adjustment

077-2.2.2.3 Instructions for Use. For personnel safety, tuck all loose life preserver strap ends into pockets, shirt, or belt. After entering the water, the chest strap can be unbuckled and used to connect survivors to each other, lifeboats, or other flotation devices.

077-2.2.2.4 Modification for Safety Harness. A number of life preservers may be modified by ship's force to permit use of a safety harness worn under the life preserver when the wearer is working over the side or in the weather during heavy seas. The modification consists of sewing a 3-3/4-inch long buttonhole into the back cover of the life preserver. This allows the safety harness D-ring to protrude through the life preserver. A safety line can then be attached to the D-ring. The life preserver safety harness modification is illustrated in Figure 077-2-4. Stowing the modified life preserver and safety harness together is recommended.

077-2.2.2.4.1 Stitching shall conform to FED-STD-751 (Type 304) and shall be 14 to 20 stitches per inch. Tack stitching at ends of the buttonhole with six to eight stitches in the tack. Use black thread conforming to FED SPEC V-T-276 (Type IB3, 4 ply, Ticket No. 16).

077-2.2.3 VEST WORK TYPE. The inherently buoyant, vest work type life preserver is used for shore activities or activities in protected waters only and is not a shipboard allowance item.

WARNING

The preserver is not self-righting and will not always keep an unconscious wearer's head face up and out of the water while awaiting rescue. Do not use outside protected waters.

077-2.2.4 YOKE TYPE. The inherently buoyant yoke type life preserver is illustrated in Figure 077-2-5. This life preserver provides 50 pounds of buoyancy. The primary use of this type of life preserver is for pack carrying troops in amphibious operations. The life preserver is worn around the neck and can be removed with one hand without affecting the backpack.

077-2.2.4.1 Construction. There are two body sections and one collar flotation section which are filled with fibrous glass or plastic foam flotation pads. The life preserver is held in place by a combined waist and crotch strap designed for quick release. In addition, a quick-disconnect is provided between the left body section and the collar. This life preserver has no accessories.

077-2.2.4.2 Donning and Adjusting. The yoke type life preserver is donned and adjusted as follows:

1. Unbuckle the quick-disconnect studs. Fully extend and straighten the combined waist and crotch strap.
2. Place life preserver around the neck and bring down in front, as shown in Figure 077-2-5.
3. Secure the tie straps around the neck with a bow knot. **Never tie a square knot** . Neck tie straps are tied, as shown in Figure 077-2-6.
4. Pass combined waist and crotch strap through the legs from front to rear. Pass the strap around to front of the body and under the segment of strap stitched to life preserver. See Figure 077-2-6 and Figure 077-2-7.
5. Attach the quick-disconnect studs (see Figure 077-2-7) together.

6. Adjust the waist strap so that it is comfortable and snug. Tighten by pulling strap through D-ring, as shown in Figure 077-2-8.

077-2.2.4.3 Removing the Life Preserver. The inherently buoyant, yoke type life preserver can be removed using one hand as follows:

1. Pull waist strap quick-release D-ring, shown in Figure 077-2-8, allowing life preserver to come loose.

2. With left hand, grasp and pull collar quick-release snap studs. This allows the preserver to fall free from wearer.

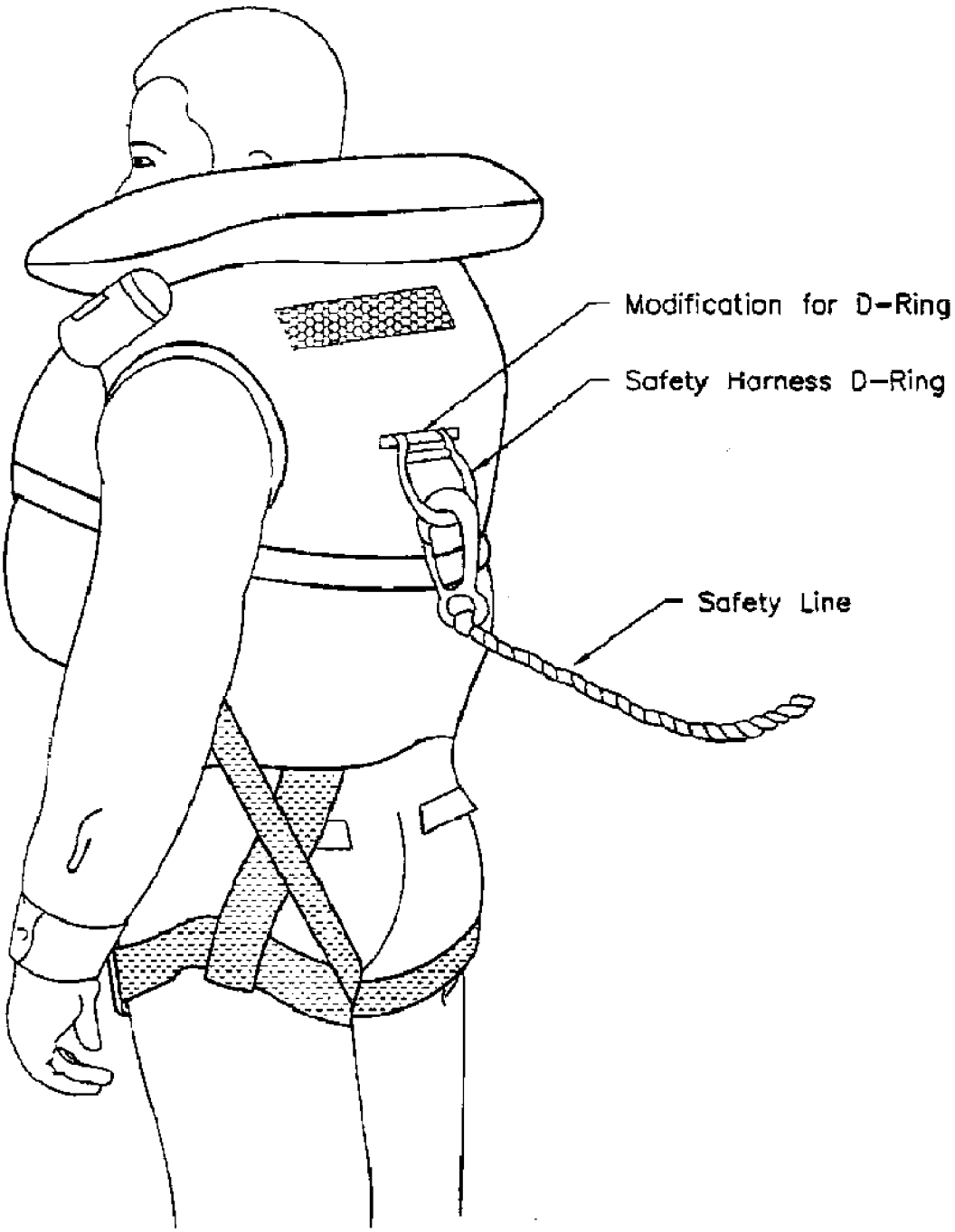


Figure 077-2-4. Vest Type Safety Harness Modification

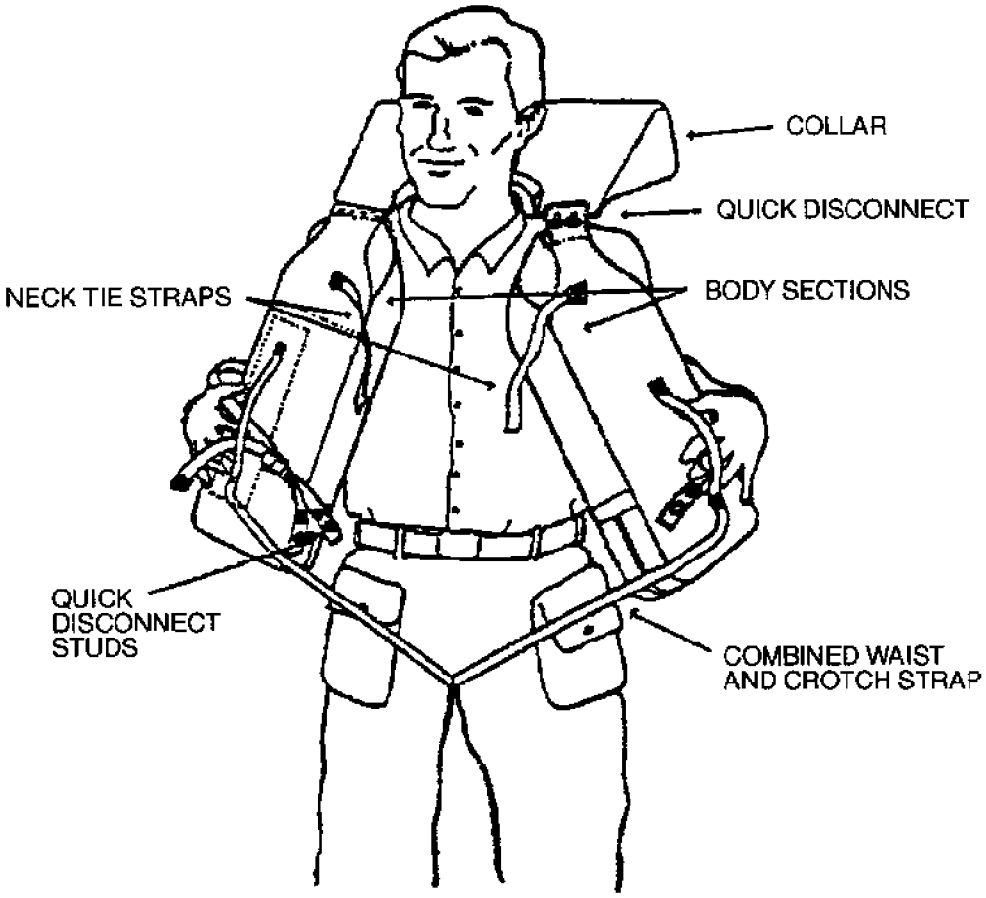


Figure 077-2-5. Yoke Type Life Preserver

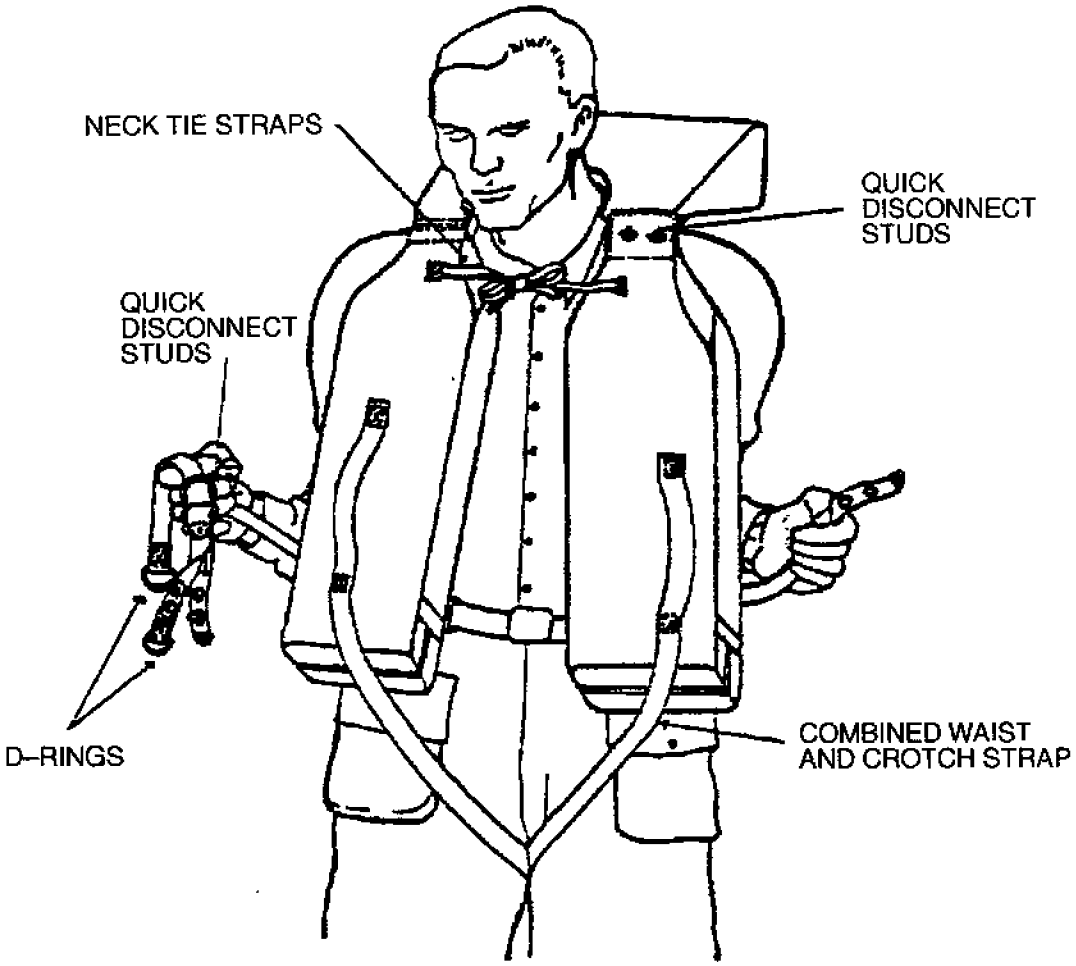


Figure 077-2-6. Yoke Type Life Preserver, Arrangement of Neck Tie Straps, Waist and Crotch Strap

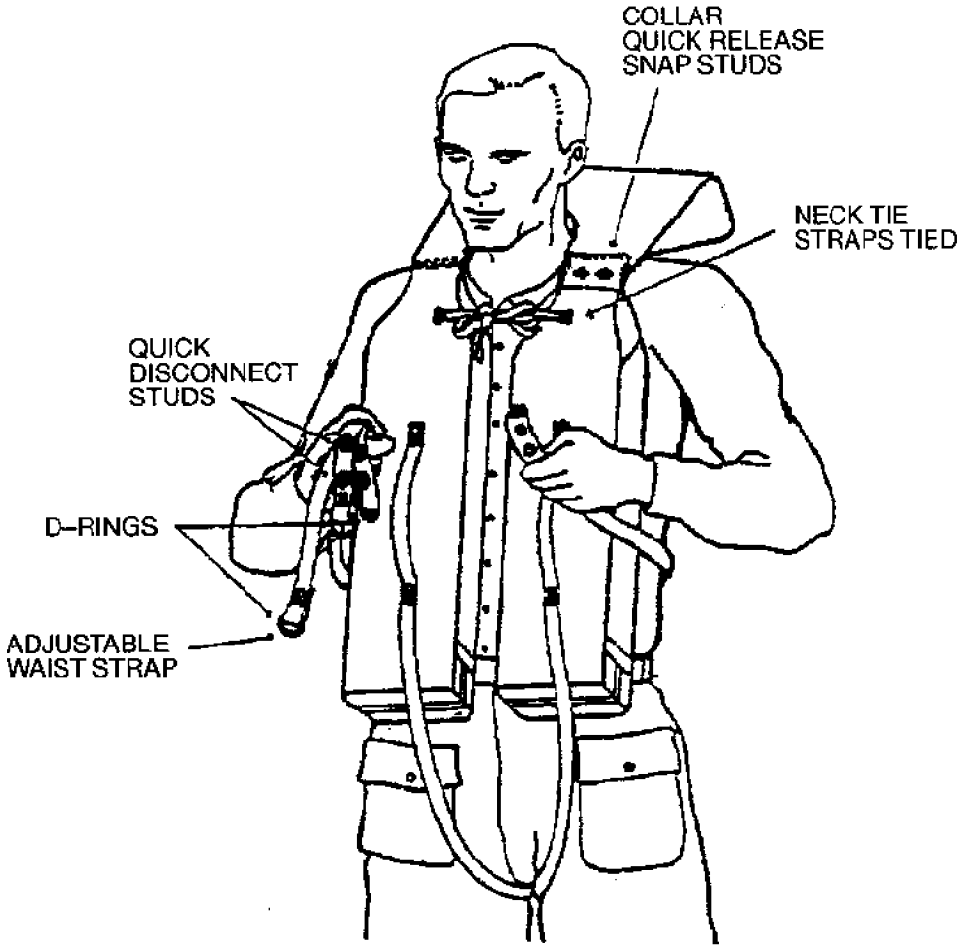


Figure 077-2-7. Yoke Type Life Preserver, Quick-Disco nnect Studs and D-Rings

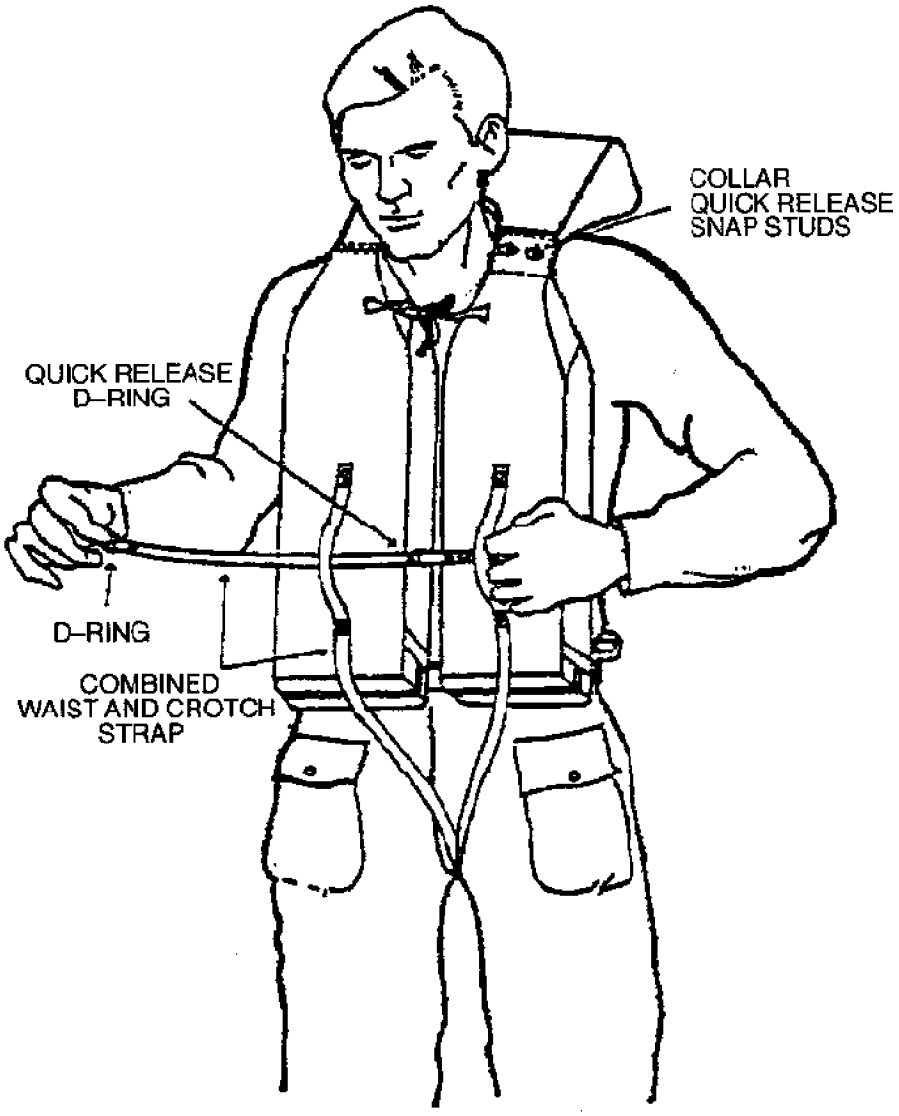


Figure 077-2-8. Yoke Type Life Preserver, Final Donning Adjustment

077-2.2.5 FLOTATION MATERIALS FOR INHERENTLY BUOYANT LIFE PRESERVERS. Fibrous glass or plastic foam is used for filling inherently buoyant life preservers. These materials are described in the following paragraphs.

077-2.2.5.1 Fibrous Glass Filling. Fibrous glass is waterproofed to improve its natural buoyancy. Because this material is naturally mildew and fire resistant, it has replaced kapok. The fibrous glass is packed into cotton bags to form small pads. These pads are sealed in vinyl film envelopes to protect the fibrous glass and to prevent water penetrating air spaces around the fibrous glass.

077-2.2.5.2 Plastic Foam Filling. The plastic foam does not absorb water. It is also naturally mildew and fire resistant. The plastic foam is formed into pads which are inserted in the preserver cotton covers. All inherently buoyant vest type life preservers with collar (MIL-L-18045) are being procured with plastic foam filling.

077-2.2.6 STOWAGE OF INHERENTLY BUOYANT LIFE PRESERVERS. Prior to storage, dry and air out life preservers, then check for damage. Stow in a dry location out of direct sunlight and between 0° C (32° F) and 38° C (100° F). Heat, moisture, and light deteriorate the plastic, cloth, and thread materials used in the life preservers. A dry place is one where water or condensation does not come in contact with stowed preservers.

077-2.2.6.1 Exercise care to prevent damage caused by sharp edges when life preservers are stowed.

077-2.2.6.2 In wartime, ships transporting troops shall have the ship's entire allowance of yoke type preservers available for troops. Stow these preservers in ready-use lockers.

077-2.2.7 MAINTENANCE OF INHERENTLY BUOYANT LIFE PRESERVERS. Conduct regularly scheduled maintenance of inherently buoyant life preservers and accessories in accordance with PMS requirements. Immediately repair or replace damaged life preservers.

077-2.3 INFLATABLE LIFE PRESERVERS

077-2.3.1 TYPES. There are three types of inflatable life preservers used by general shipboard personnel. They are either inflated by carbon dioxide (CO_2) cylinders or inflated orally by the use of an oral inflation tube. These life preservers are as follows:

a. MK 1 Vest Type

b. Abandon-Ship Type with Pouch

c. Auto-Inflatable Utility Life Preserver (AIULP)

077-2.3.1.1 Specialized inflatable life preservers are covered in other manuals, including:

a. Self Contained Underwater Breathing Apparatus (SCUBA) MK 4 Type (Technical Manual SS-710-AA-MMO-010/TM-LPSP/MK4)

b. Aviation Crew Systems Inflatable Survival Equipment (NAVAIR Technical Manual 13-1-6-1)

077-2.3.2 MK 1 VEST TYPE. The MK 1 vest type life preserver automatically inflates, provides a minimum of 29 pounds of buoyancy, and is self-righting. The design keeps an unconscious wearer's head face up and out of the water while awaiting rescue. For flight deck personnel, the MK 1 vests are provided in seven colors to identify the personnel's functions. The color designations are as follows:

a. White - Phone talkers and medical corpsmen

b. Red - Ordnance men

c. Green - Catapult and arresting gear personnel

d. Blue - Plane pushers

e. Brown - Plane captains and mechanics

f. Yellow - Flight deck officers and plane directors

g. Purple - Fuel handlers

WARNING

MK 1 life preservers are not authorized for use on aircraft. When submerged in water, the automatic inflation assembly will actuate and an inflated preserver could trap the wearer aboard the aircraft. MK 1 life preservers with automatic inflation assemblies shall be labeled with a warning against its use on aircraft.

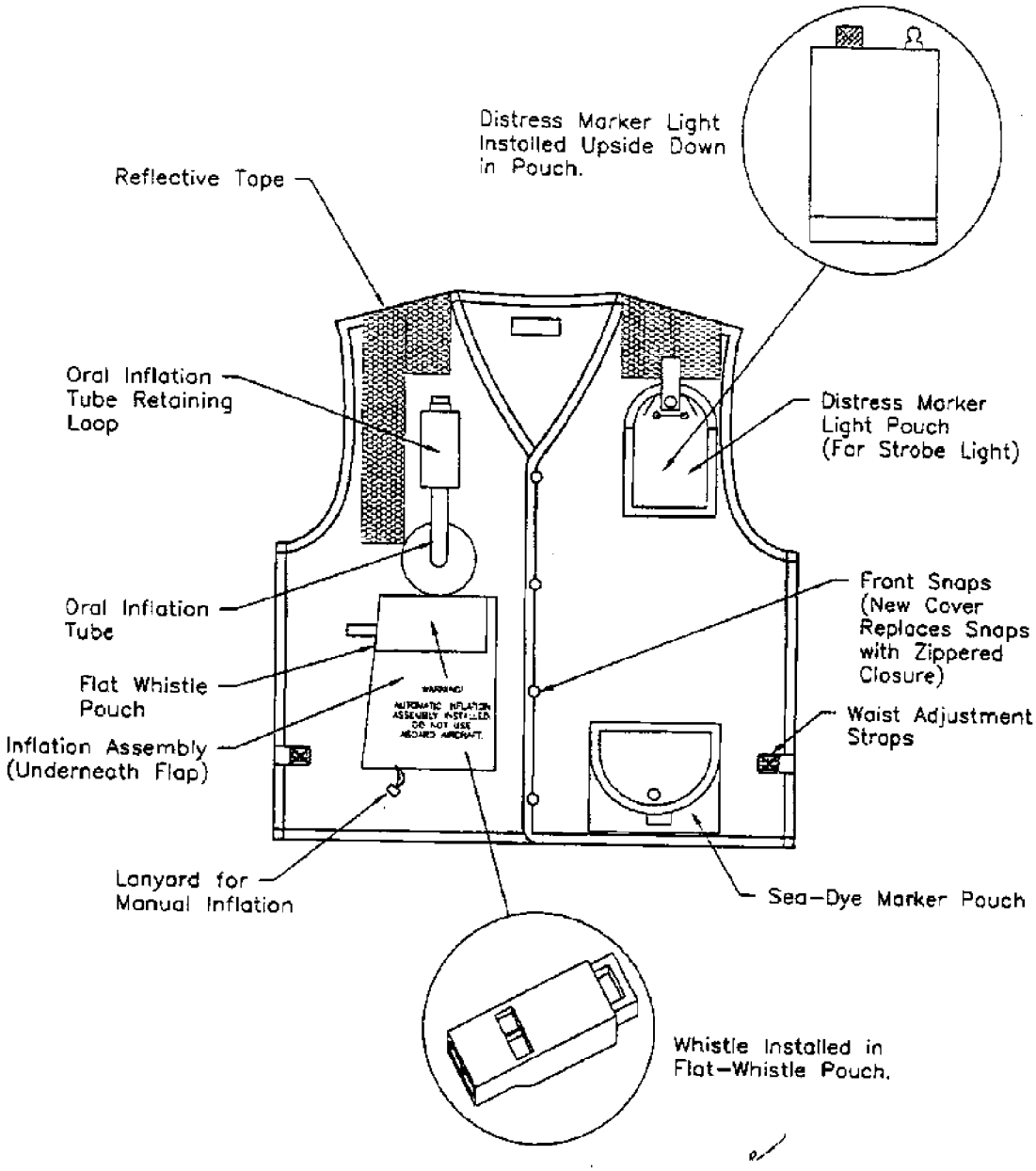


Figure 077-2-9. MK 1 Vest Type Life Preserver

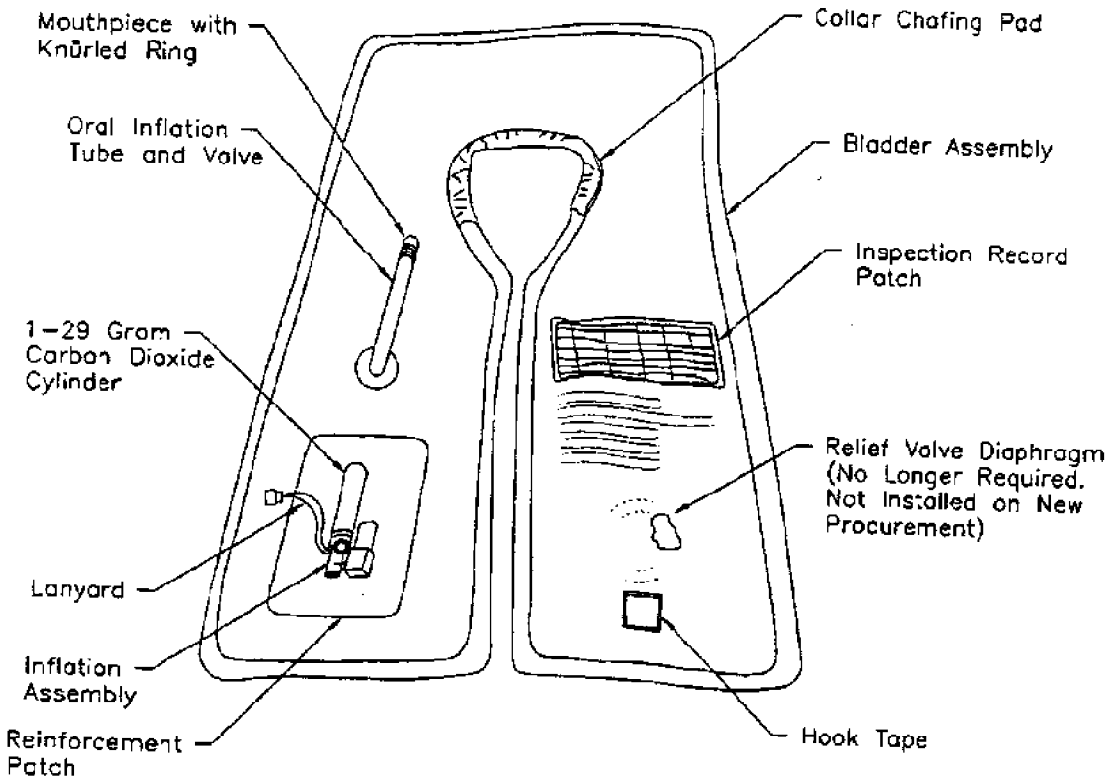


Figure 077-2-10. Inflatable Bladder for MK 1 Vest Type Life Preserver

077-2.3.2.1 Construction. The MK 1, shown in Figure 077-2-9, consists of a cloth cover, an inflatable bladder, and an inflation assembly. The bladder is removable from the cover for cleaning, repair, and replacement of the cover or bladder.

077-2.3.2.1.1 The cloth cover is a sleeveless cardigan style vest. A compartment for the inflatable bladder is formed between the vest's outer cover and lining. A 2-inch by 4-inch patch of loop fastener tape is attached to the left front portion of the compartment to help secure the bladder within the cover. (See paragraph 077-2.3.2.5 for optional modification if size of tape is incorrect.) Two types of front closure are used: unidirectional snaps on older models and a zipper for newer models. Side buckle waist adjustment straps are used to snug the vest to the body.

NOTE

New covers with zippered front closures are being issued that allow the use of a safety harness worn under the life preserver when working over the side. A buttonhole in the back is provided in the new cover to allow the safety harness D-ring to protrude through the cover. Old covers with the unidirectional front closure snaps should not be modified to include the safety harness buttonhole.

The cover is available in three sizes with slack in each size so foul weather gear can be worn under the life preserver. Pockets for a whistle, a distress marker light, and a sea-dye marker are sewn onto the cover. Reflective tape is sewn across each shoulder and the back of the cover. Openings in the front of the cover are provided

for the inflatable bladder's inflation assembly manifold and the oral inflation tube. A retaining loop for the inflation tube is provided above the opening of the tube (see Figure 077-2-9). The opening for the manifold is located under an inflation assembly protective flap and is large enough to permit passage of the inflation assembly without removing it from the bladder. The protective flap completely covers the inflation assembly. A restraining strap for the CO_2 cylinder is sewn into the cover under the inflation assembly protective flap.

077-2.3.2.1.2 The inflatable bladder, shown in Figure 077-2-10, is a single-chamber horseshoe-shaped bladder. One size is used to fit all vest cover sizes. An oral inflation tube and a brass manifold for the inflation assembly are provided on the right front portion of the bladder. The manifold contains a check valve to prevent leakage. A reinforcement patch is located around the brass manifold. To secure the bladder within the cover, a 2-inch by 4-inch piece of hook tape is secured to the left front portion of the bladder.

NOTE

Older bladders have a pressure relief valve attached to the left back portion of the bladder to prevent overinflation. This valve was determined to be unnecessary and has been eliminated in the manufacture of new bladders. Bladders in service with this relief valve shall be retained in service, tested, and maintained as required until no longer serviceable.

077-2.3.2.1.3 Only the automatic inflation assembly is authorized for use on the MK 1 life preserver. The automatic inflation assembly holds one cylinder containing 28 to 31 grams of CO_2 (MIL-C-25369, Type II). When immersed in water, a battery-powered electronic circuit is completed that automatically activates the inflation mechanism. There are presently two auto-inflation assemblies available: S-TRON and Conax. The S-TRON assembly uses two 6 volt batteries as a power source and Conax uses one 12 volt battery. The automatic inflation assembly can also be activated manually by pulling a lanyard attached to an actuating lever, releasing the CO_2 to inflate the bladder. These inflation assemblies can be actuated only once automatically but multiple times manually.

077-2.3.2.1.4 Accessories included with this life preserver are identified in Table 077-2-2. The distress marker light, a type SDU-5E, is used only on the MK 1 life preserver. To attach the light to the impact resistant flight deck crew safety helmet (also called the cranial helmet) after entering the water, attach as needed a strip of hook tape on the back of the distress marker light, in accordance with the instructions contained in paragraph 077-2.6.2.3. Lanyards are used to attach the distress marker light, sea-dye marker, and whistle to the vest. The lengths of the lanyards and attachment methods are provided in PMS requirements.

077-2.3.2.2 Donning and Adjusting. The MK 1 life preserver is donned as follows:

1. Before donning the MK 1 life preserver, inspect it in accordance with PMS requirements.
2. After the inspection, put the preserver on and secure the front closure:
   a For preservers with the snap front closure, secure the four snaps from the bottom of the vest to the top of the vest. The unidirectional snaps are secured by first engaging the tab and slot at the bottom of the male and female halves of the snap and then squeezing the two halves of the snap together.
   b For preservers with the zippered closure, zip all the way to the top, leaving tab in down position, secure hook and pile tape closure over the zipper tab.
3. Tighten the waist adjustment straps to keep the preserver close to the body.

077-2.3.2.3 Instructions for Use. When wearing the MK 1 life preserver, the front shall be closed and secured at all times to ensure the life preserver will not come off in the water. The MK 1 life preserver may be inflated automatically or manually.

WARNING

Never inflate the life preserver before entering the water.

077-2.3.2.3.1 The automatic inflation assembly is activated within three seconds after immersion in water to inflate the bladder. Inadvertent wetting should not activate the inflation assembly.

WARNING

Automatic inflation assemblies can only be actuated once automatically. Replace the automatic inflation assembly after an automatic inflation. Discard the used assembly and replace in accordance with PMS procedures.

NOTE

There have been several reported incidents of Conax automatic inflators installed on MK 1 life preservers experiencing activations after several hours of exposure to heavy rain. To reduce the risk of incidence, trim the bottom edge of the closure flap behind the inflator and any loose threads that may contact the inflator's battery housing.

077-2.3.2.3.2 Manual inflation is accomplished by pulling down on the lanyard attached to the inflation assembly. The lanyard is shown in Figure 077-2-9. The inflation assembly can be manually operated repeatedly, provided the CO_2 cylinder is replaced each time.

077-2.3.2.3.3 Oral inflation of the life preserver is required if the CO_2 inflation system fails or if additional inflation is desired. To accomplish this, use the following procedure:

1. Remove oral inflation tube from the retaining loop (see Figure 077-2-9). Turn knurled ring down as far as possible (see Figure 077-2-10). This unlocks the oral inflation valve.
2. Hold inflation tube in one hand and place mouth on mouthpiece.
3. Blow air through mouthpiece while depressing it with the mouth or hand.
4. Release mouthpiece after each exhalation.
5. After inflation is achieved, lock the oral inflation valve closed by turning knurled ring up against mouthpiece as far as possible.

077-2.3.2.4 Removing the Life Preserver. The MK 1 life preserver is removed as follows:

1. Loosen the waist adjustment straps.

2. Open the front closure:

   a For preservers with the snap front closure, disengage the front closure snaps from the top of the vest to the bottom of the vest. The unidirectional snaps can be disengaged by pulling the two halves of the snap apart at the top of the snap.

   b For preservers with the zippered closure, open the hook and pile tape secured flap over the zipper tab, then unzip the vest.

3. Remove the vest and stow as discussed in paragraph 077-2.3.5.

077-2.3.2.5 Modification of Hook and Pile Tape for Securing Bladder to Cover. Older models have 1-inch wide hook and pile tape patches for securing the bladder to the cover, whereas newer models have 2-inch wide patches. If desired, additional pile tape can be sewn to the inside front cover. Exact materials and dimensions are at the discretion of the individual command, but should be limited to the area between the dye marker pouch and DML pouch. Do not install additional hook tape patches to the bladder. The types of adhesives readily available to the fleet are ineffective on newer coated fabric bladders and may actually damage the bladder material.

077-2.3.3 ABANDON-SHIP TYPE WITH POUCH (LPP-1). This inflatable life preserver provides 29 pounds of buoyancy. A lifting harness is attached to the life preserver for lifting of the wearer from the water during rescue. The life preserver comes in orange or gray. Gray is used only for Marine helicopter assault operations.

077-2.3.3.1 Construction. The abandon-ship life preserver, shown in Figure 077-2-11, consists of a waist belt and pouch for carrying the life preserver while not in use, a buoyancy chamber (with no cloth cover), and an inflation assembly.

077-2.3.3.1.1 The waist belt is 2-inch wide webbing with a buckle and two slide adjusters. The pouch for stowing the buoyancy chamber and life preserver accessories has slots for the waist belt to pass through. Two snap fasteners are provided for pouch closure. A lifting strap, shown in Figure 077-2-12, is attached to the belt buckle and comes through the neck opening in the buoyancy chamber. This harness is made from 1-inch wide nylon webbing.

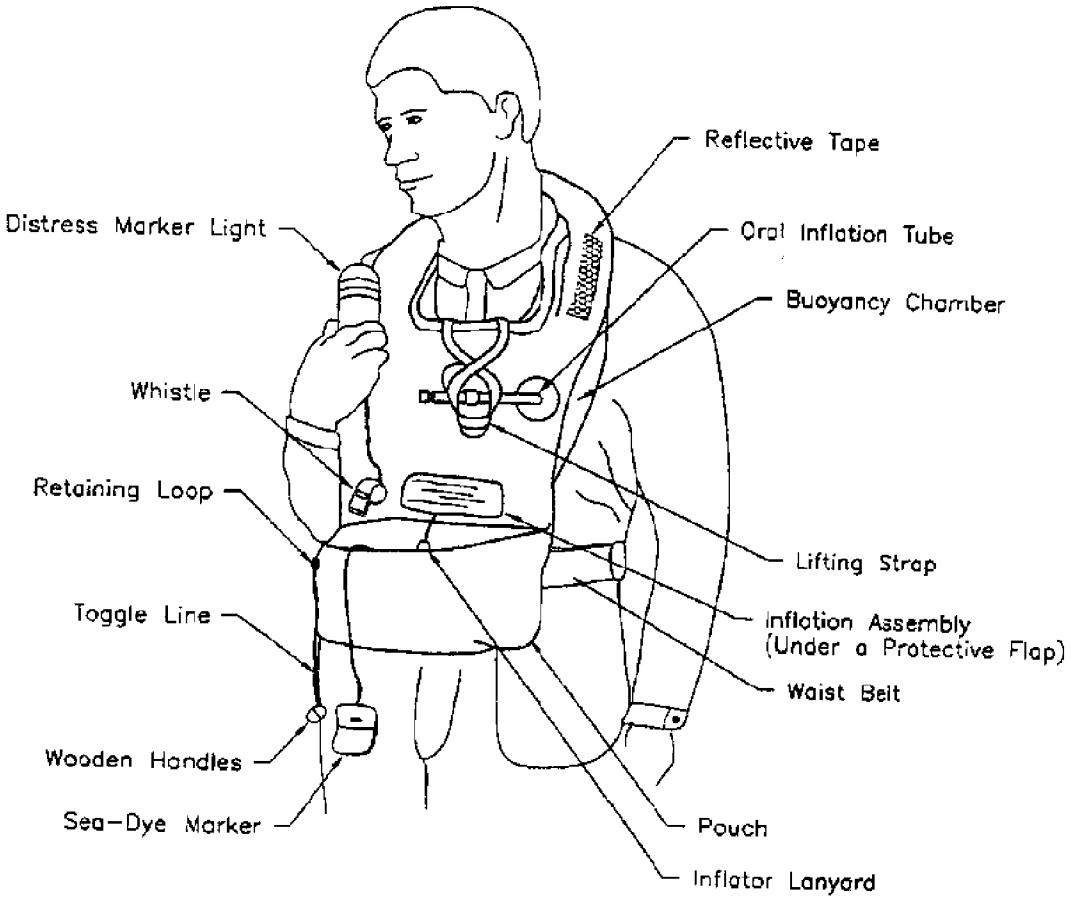


Figure 077-2-11. Abandon-Ship Type Life Preserver with Pouch

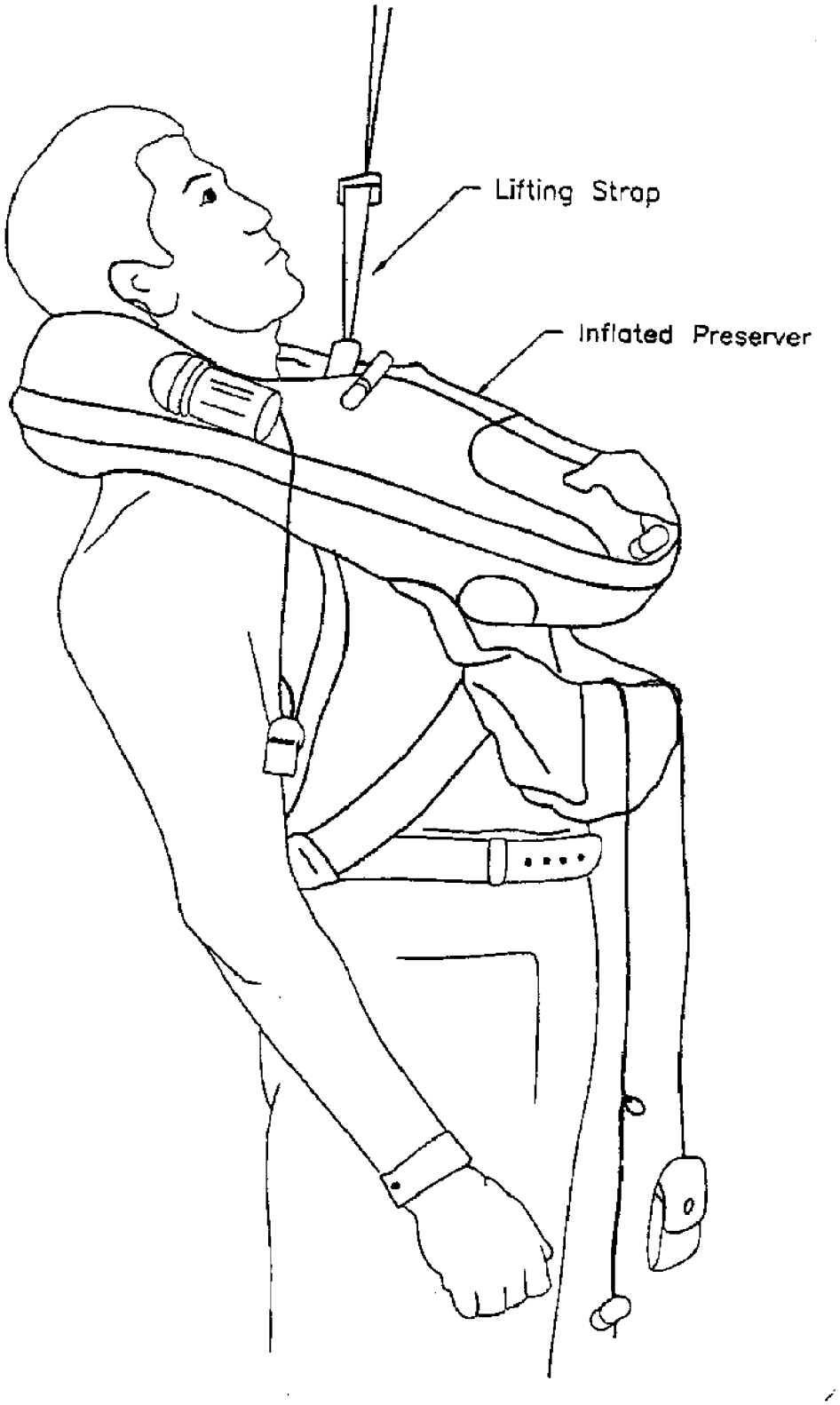


Figure 077-2-12. Abandon-Ship Type Life Preserver Lifting Harness

077-2.3.3.1.2 The buoyancy chamber is a single compartment bladder. An oral inflation tube and a brass manifold for the inflation assembly are provided on the chamber. The manifold contains a check valve to prevent leakage. A protective flap covers the inflation assembly. A loop on the chamber is provided to attach the whistle lanyard and a distress marker light. Another loop is provided for attaching to the waist belt. The orange version has reflective tape attached as discussed in paragraph 077-2.5.5. The gray version has no reflective tape attached.

077-2.3.3.1.3 The inflation assembly is a manual actuating assembly that uses a single CO_2 cartridge (MIL-C-601, Type II). The cylinder is activated by pulling on a lanyard on the manual inflator. The inflation assembly is mounted on the brass manifold on the buoyancy chamber.

077-2.3.3.1.4 Accessories included with this life preserver are identified in Table 077-2-2. The gray version used for Marine helicopter assault operations is not provided with any accessories. The toggle line, used for connecting survivors to flotation devices such as life lines and to other survivors, and the sea-dye marker lanyard are tied to the waist belt. The distress marker light and whistle lanyard are connected to a loop on the buoyancy chamber.

077-2.3.3.2 Donning and Adjusting. To don the life preserver use the following procedure:

1. With life preserver rolled up in pouch, secure waist belt. Adjust belt to allow complete and free rotation of the pouch around the waist for donning. Ensure the pouch opening faces up. While not in use, wear pouch at the small of the back (see Figure 077-2-13).
2. Rotate pouch to front and unfasten pouch flap.
3. Remove life preserver from pouch and unroll.
4. Pass head through life preserver collar.
5. Ensure lower end of the preserver is out of the pouch.
6. Stow the whistle, sea-dye marker, and toggle line in the life preserver pouch. The life preserver is now in the operating position.

077-2.3.3.3 Instructions for Use. When general quarters is sounded, don life preserver with life preserver rolled up in pouch (step 1 of paragraph 077-2.3.3.2). If relaxing of full battle dress is authorized by the Commanding Officer, and the preserver is removed, keep life preserver at hand. Don the life preserver in the operating position, (steps 2 through 6 of paragraph 077-2.3.3.2) if the word is passed to prepare to abandon ship. Once the life preserver is in the operating position, wait for the signal to abandon ship.

WARNING

Never inflate the life preserver before entering the water.

077-2.3.3.3.1 After receiving the signal to abandon ship, follow the abandon-ship procedure in paragraph 077-2.4.2. Following entry into the water, pull the inflator lanyard down to inflate life preserver, as illustrated in Figure 077-2-14.

077-2.3.3.3.2 Use the toggle line to attach yourself to other flotation devices or to other survivors. Loop the wooden handle around object to be attached to, such as an adjacent survivors life preserver belt, and pass the handle back through the retaining loop on the line.

077-2.3.3.3.3 Oral inflation of this life preserver is required if the CO_2 inflation system fails or if additional inflation is desired. To accomplish this, follow the procedure outlined in paragraph 077-2.3.2.3.3. The location of the oral inflation tube is illustrated in Figure 077-2-15.

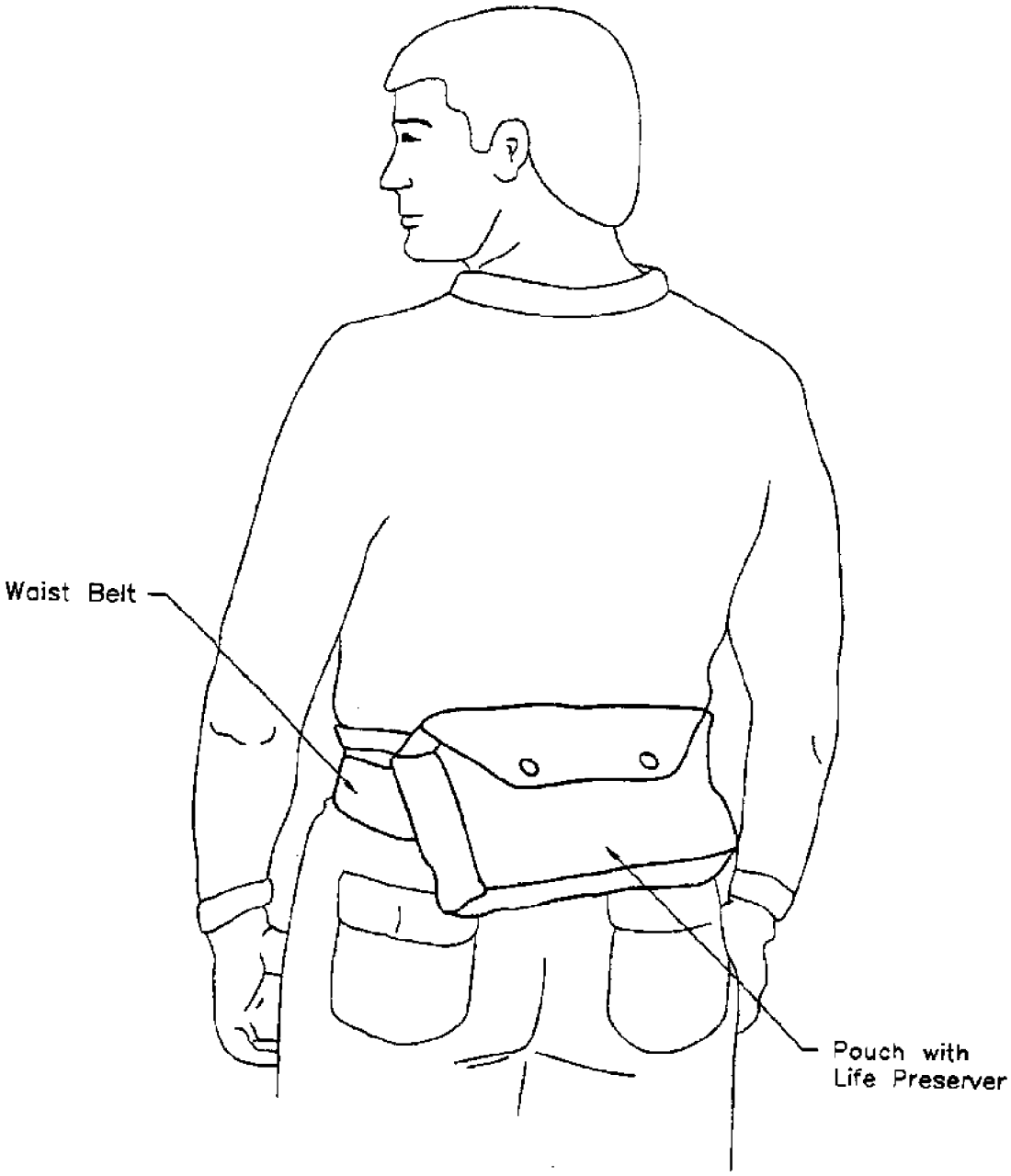


Figure 077-2-13. Abandon-Ship Type Life Preserver Pouch

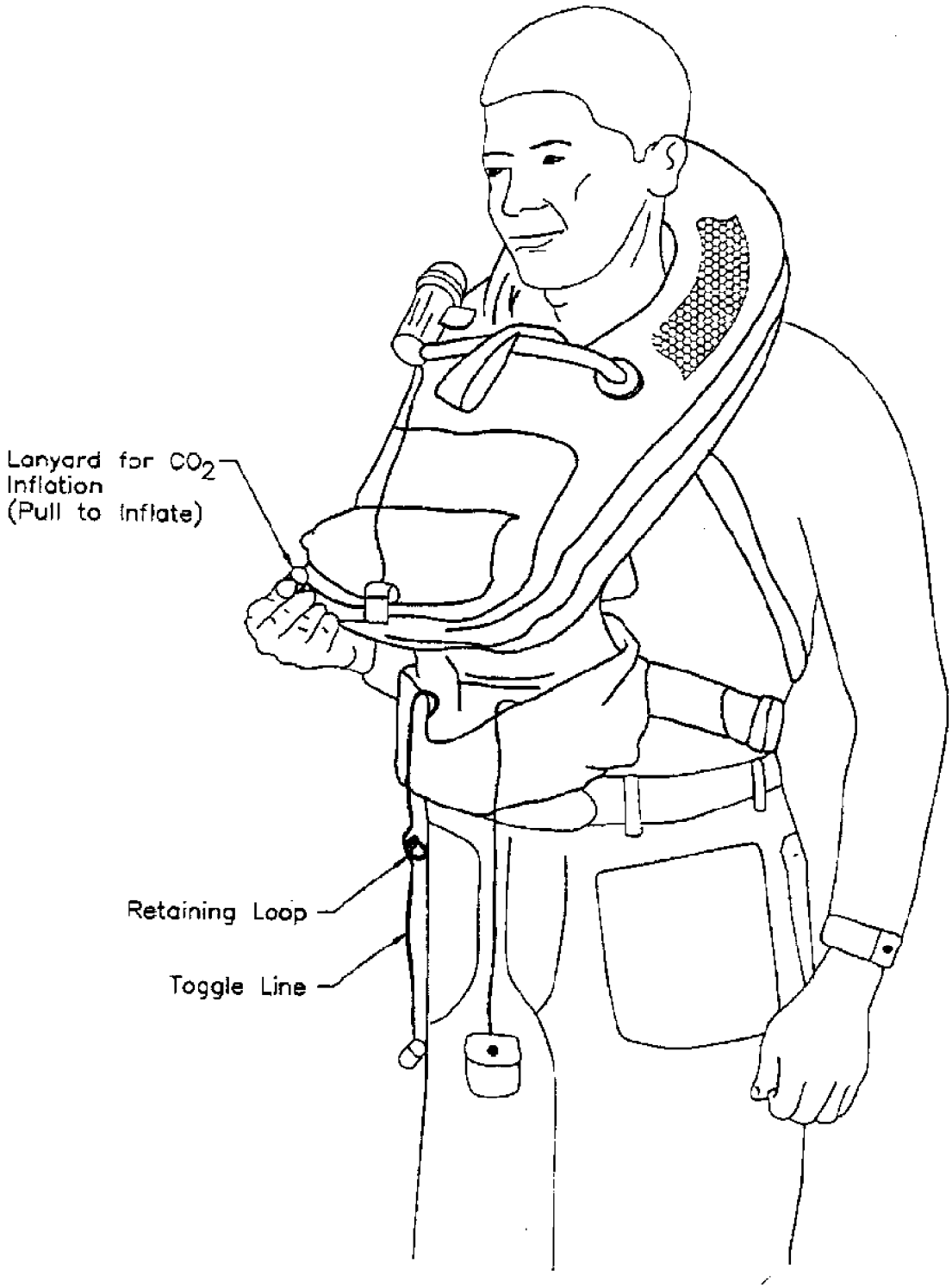


Figure 077-2-14. Abandon-Ship Type Life Preserver Inflation

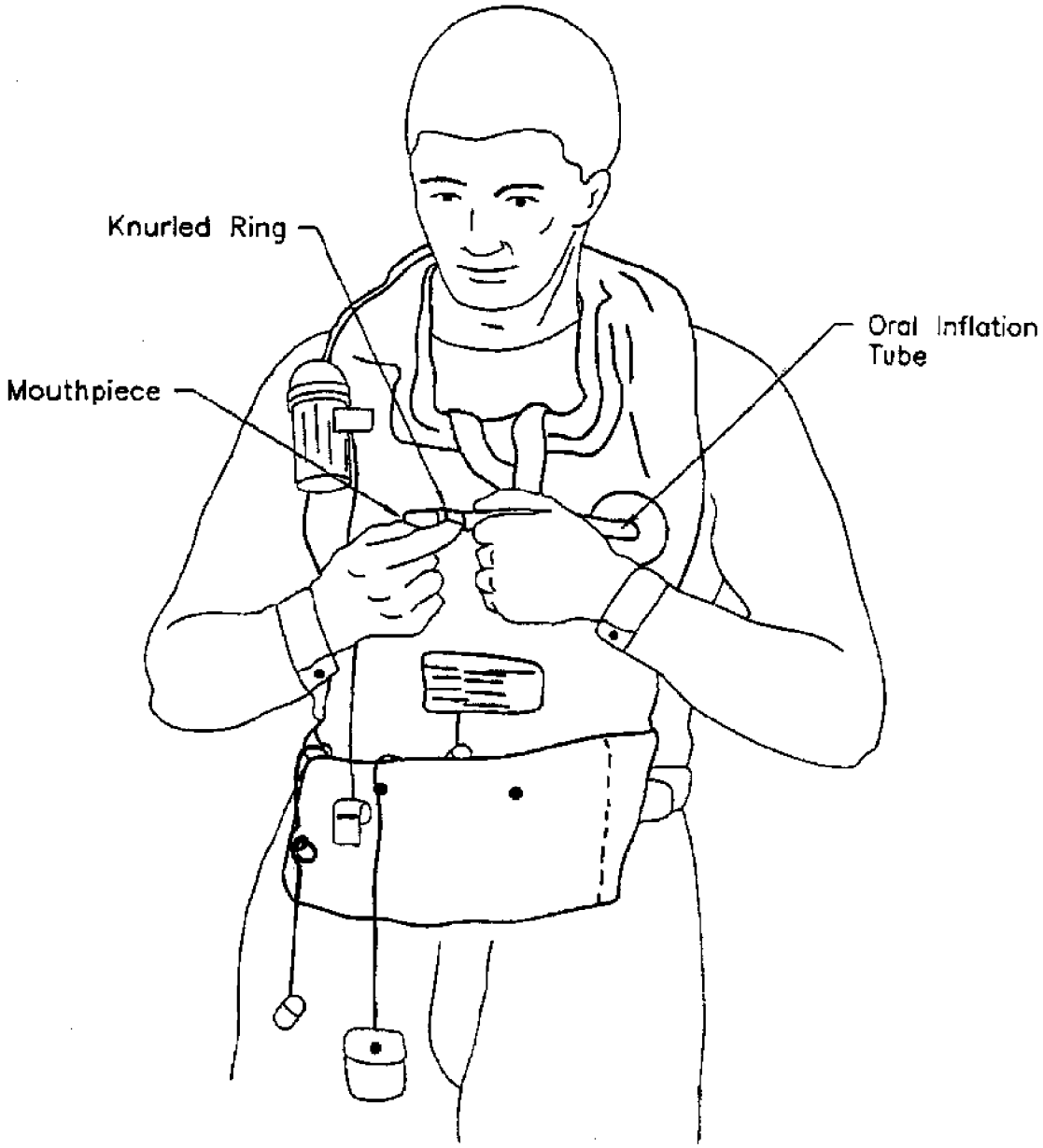


Figure 077-2-15. Abandon-Ship Type Life Preserver, Oral Inflation

077-2.3.3.4 Removing the Life Preserver. The abandon-ship life preserver is removed and repacked as follows:

1. Deflate preserver, if needed.
2. Lift deflated preserver over head and unbuckle waist belt.
3. Allow life preserver to dry and air out.
4. If life preserver was manually inflated, replace the CO_2 cylinder.
5. Roll preserver up and stow in pouch.

6. Wrap toggle line around wooden toggle and stow in pouch. Stow remaining life preserver accessories within the pouch.

7. Close pouch snaps.

8. Stow in an appropriate location as discussed in paragraph 077-2.3.5.

077-2.3.4 AUTO-INFLATABLE UTILITY LIFE PRESERVER (AIULP). The AIULP, shown in Figure 077-2-16, is a lightweight life preserver providing 30 pounds of buoyancy. The AIULP is designed to keep an unconscious wearer's head face up and out of the water while awaiting rescue. The AIULP is no longer being procured but may be used until no longer serviceable. The MK 1 vest type life preserver is authorized to replace the AIULP.

077-2.3.4.1 Construction. The AIULP technical manual (SS710-AB-MMO-0l0) describes the life preserver and its accessories in detail and provides directions for its use and care. The automatic inflation assembly is the same as used on the MK 1 vest type life preserver discussed in paragraph 077-2.3.2.1.4.

077-2.3.4.1.1 The only support component is a safety harness, which shall be worn under the life preserver when the wearer is working over the side of a ship.

077-2.3.5 STOWAGE OF INFLATABLE LIFE PRESERVERS. Stow inflatable preservers in ready-use lockers. Prior to stowage, dry and air out life preservers. Stow in a cool, dry place out of direct sunlight and between 0° C (32° F) and 38° C (100° F). A dry place is one where water or condensation does not come in contact with stowed preservers. Heat, moisture, and light cause deterioration of coated cloth and thread materials used in the construction of life preservers. Keep spare CO_2 cylinders free of moisture.

WARNING

Do not stow spare CO_2 cylinders or life preservers equipped with CO_2 cylinders near steam lines or radiators. The heat from the steam lines or radiators could cause cylinders to explode, resulting in injury or death to personnel.

077-2.3.5.1 Avoid sharp edges in stowage. They will increase life preserver wear and tear and may also puncture inflatable buoyancy chambers. A punctured chamber will not become buoyant, causing injury or loss of life.

077-2.3.6 MAINTENANCE OF INFLATABLE LIFE PRESERVERS. Conduct regularly scheduled preventive maintenance of inflatable life preservers and accessories in accordance with PMS requirements. PMS requirements include pre-use inspections, periodic leakage tests and functional tests, and repair procedures. Damaged preservers shall be repaired or replaced immediately. Torn or punctured buoyancy chambers shall be replaced and not repaired. Automatic inflators that have actuated automatically shall be replaced and discarded since the automatic actuation mechanism can be fired only once. The automatic inflators should not be removed from bladder manifolds except to replace the inflator. The MK 1 life preserver cover is designed to allow removal of the bladder without removing the inflation assembly from the bladder manifold.

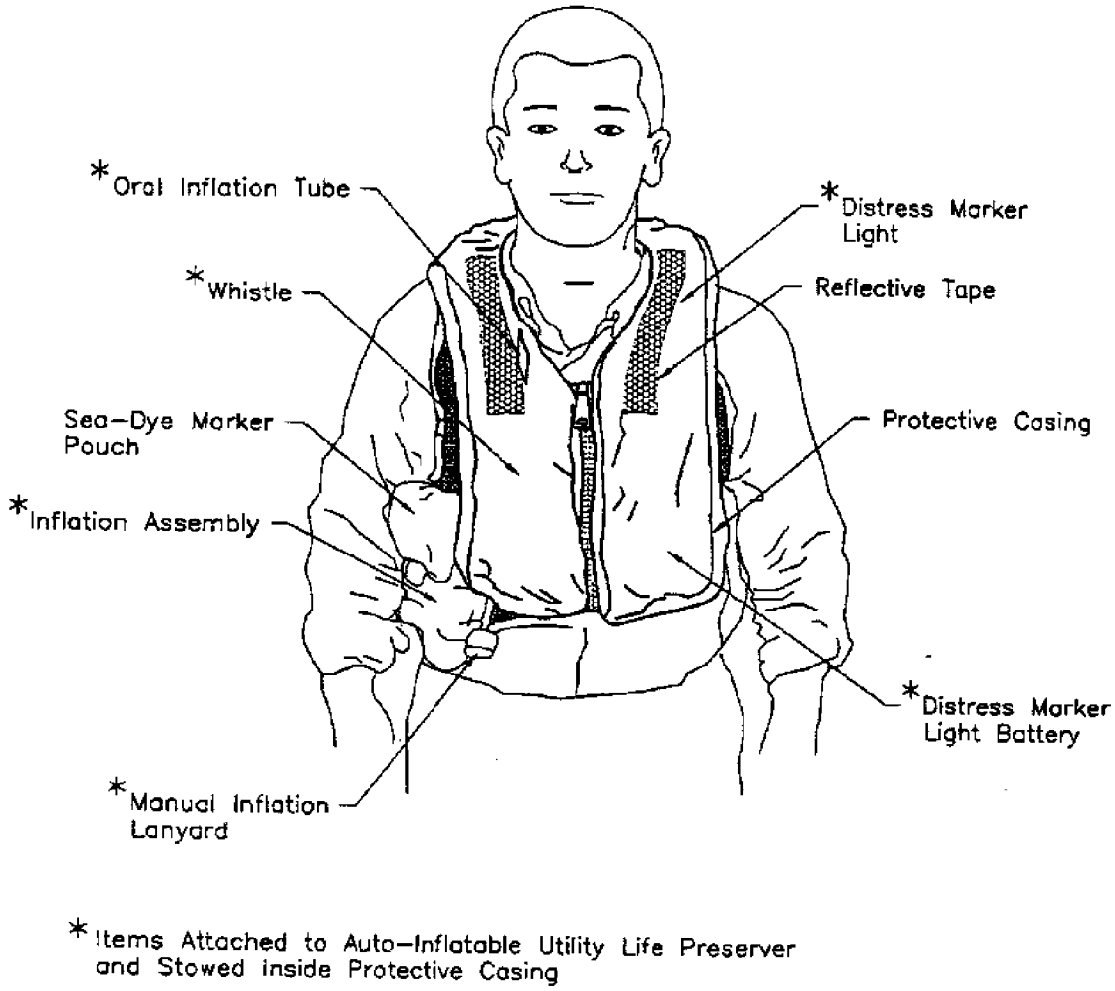


Figure 077-2-16. Auto-Inflatable Utility Life Preserver (Not Inflated)

077-2.4 GENERAL COMMENTS - ALL LIFE PRESERVERS

077-2.4.1 PRECAUTIONS. Remember the life preserver can only save your life if it is used correctly and safely. Follow all safety requirements and restrictions on use.

1. Do not use your life preserver for other than its intended purpose. For example, using it as a pillow or cushion could damage the cover, flotation pads, or buoyancy chamber. This will leave you with a useless life preserver when you need it.

2. Always keep life preservers clean and neatly stowed in the proper location when not in use.

3. Make sure all required accessories, identified in Table 077-2-2, are on the life preserver. These items include the whistle, distress marker light, toggle line, reflective tape, and sea-dye marker.

4. Life preserver webbing and straps have a purpose. Be sure you know what those purposes are, and do not proceed to your station without securing them. Dangling webbing and straps can snag easily, causing injury.

077-2.4.2 ABANDON-SHIP PROCEDURE. If ordered to abandon a sinking ship, wear the abandon-ship inflatable life preserver with pouch.

WARNING

Never inflate an inflatable preserver before entering the water.

WARNING

Do not abandon a ship surrounded by flames with the AIULP, MK 1, or an inherently buoyant preserver donned. These life preservers will not permit the wearer to swim underwater, below the flames. If it is not possible to obtain an inflatable abandon-ship life preserver, an inherently buoyant type, or AIULP or MK 1 preserver may be used for abandoning a sinking ship if it is not surrounded by flames.

1. Use an abandon-ship ladder to lower yourself into the water. If a ladder is not available, a well-secured line or firehose may be used. When possible, leave the ship on the windward side and from the point closest to the water so that the ship and any burning fuel will drift away from you.
2. If you have to jump, instead of lowering yourself into the water, securely fasten the life preserver and keep it close to the body. This is accomplished by folding arms across the chest and gripping the life preserver with the fingers. This prevents the life preserver from riding up and striking the chin or neck. Keep body erect and legs held together and crossed when jumping. If necessary to jump into burning water, place one hand over mouth with palm under chin and fingers split over nose. The other hand is placed on life preserver collar to keep it from riding up.
3. Completely adjust life preservers for injured personnel before they enter the water. Lower injured personnel into the water.
4. Once in the water, swim away from the ship as rapidly as possible. If there is debris and oil in the water, use the breast stroke to clear a path. If space is available, climb into a lifeboat or liferaft. If there is no room in the rafts or boats, use a safety line or toggle line to attach life preserver to a raft, boat, or other personnel wearing life preservers.
5. If underwater explosions are occurring in the area, swim or float on your back. Keep your head and chest out of the water. This will prevent injury to vital parts of the body such as eardrums, lungs, sinuses, and abdomen.

077-2.5 LIFE PRESERVER ACCESSORIES

077-2.5.1 TYPES. Life preserver accessories are used for locating personnel in the water. The accessories that are attached to the various life preservers are shown in Table 077-2-2. The following paragraphs discuss these accessories. Small items like whistles and distress marker lights may not seem important until you are overboard. Keep life preserver accessories attached to the equipment.

077-2.5.2 DISTRESS MARKER LIGHTS. Distress marker lights are attached to life preservers to provide a means for detecting persons on the surface of the water at night. The distress marker lights are small and lightweight.

077-2.5.2.1 Construction. The distress marker light for the inherently buoyant vest type life preserver and the abandon-ship type life preserver is made of a single plastic cylinder which holds a single D-cell battery. There is a safety pin attached to the cylinder for securing this type of light to the life preserver. The lens is a clear dome which provides 360-degree horizontal visibility, as well as visibility from above. Whether life preservers are in use or not, the distress marker light shall be attached high on the shoulder, as shown in the life preserver illustrations in this chapter. The distress marker light for the MK 1 life preserver is a mercury strobe light, Type SDU-5E. The AIULP distress marker light is discussed in the AIULP technical manual SS710-AB-MMO-010.

077-2.5.2.2 Distress Marker Light Location. The inherently buoyant vest type and the abandon-ship type life preservers have a loop provided for attaching the distress marker light using the light safety pin. When attaching the light, take care not to damage the outer cover or flotation bladder. The MK 1 life preserver strobe light is stowed with the light upside down in the distress marker light pouch. A lanyard tied to the light and to grommets on the pouch is wrapped around the light when stowed in the pouch. The AIULP distress marker light is stowed as described in the AIULP technical manual SS710-AB-MMO-010.

077-2.5.2.3 Distress Marker Light Attachment. Add a 2-inch by 2-3/4-inch piece of hook tape on the SDU-5E distress marker light for attaching it to the flight deck cranial helmet. The procedure for attaching the hook tape and pile tape using adhesive is as follows:

1. Apply adhesive to the unmarked side of the light and underside of the hook tape.
2. Allow adhesive to become tacky, and press hook tape firmly onto prepared area.
3. Apply adhesive to 2-inch by 2-inch area on left side of front cranial impact shell assembly between reflective tape and edge of shell assembly. Apply adhesive to underside of pile tape.
4. Allow adhesive to become tacky, and press pile tape firmly onto prepared area.

077-2.5.2.4 Operating Instructions. Lights, except for the AIULP distress marker light, are activated by a thumb switch.

077-2.5.2.5 Maintenance. Test and inspect distress marker lights in accordance with PMS requirements. Repair or replace any distress marker lights requiring maintenance.

077-2.5.3 CHEMICAL LIGHTS. Chemical lights contain separated chemicals which produce light when mixed. The length of time the light lasts and how intense it illuminates is dependent on the temperature. These lights can only be used once. There are two types of chemical lights approved for use on life preservers:

a. Chemical Light Stick.
b. Personnel Marker Light (PML).

077-2.5.3.1 Chemical Light Sticks. Chemical light sticks can be used to supplement distress marker lights on life preservers. They shall be lighted for underway replenishment operations at night. The green light produced

inside the tube will last 3 to 12 hours. The chemical light stick consists of a plastic tube filled with a green fluorescent compound. A vial of activating compound is suspended in the fluorescent compound.

077-2.5.3.1.1 To activate the chemical light stick:

1. Remove from sealed foil wrapper.
2. Bend tube. This will break the activating vial.
3. Shake well to mix compounds together.
4. Attach the light stick with a lanyard to the loop provided on the left shoulder of the life preserver. For the MK 1 vest, attach the light to the grommets on the distress marker light pouch. For the AIULP, attach the light stick to the front zipper.

077-2.5.3.1.2 The chemical light stick also comes in red, blue, and yellow colors. These colored light sticks are approved for marking equipment. The red and blue light sticks are used at night during underway replenishment and the yellow is used in damage control operations.

077-2.5.3.2 Personnel Marker Lights (PML). U.S. Coast Guard approved chemical Personnel Marker Lights (PML's) can be used in place of distress marker lights on life preservers. The yellow-green light is visible up to 8 hours for approximately one mile on a clear night. The PML consists of a plastic light tube. The light tube is protected by a black plastic sleeve and is equipped with an actuating handle. Inside the tube are fluorescent compounds and suspended glass vials of activating compounds. The PML has a safety pin for attaching it to the life preserver loop.

077-2.5.3.2.1 To activate the PML:

1. Squeeze handle to break the suspended vials of activating compounds.
2. Remove black sleeve.
3. If the PML does not light, squeeze the handle again.
4. Attach the PML to the loop provided on the left shoulder of the inherently buoyant vest type and abandonship type life preservers. For the MK 1 vest, attach the light to the distress marker light pouch.

077-2.5.3.3 Stowage of Chemical Lights. The shelf life of the chemical light stick is about 2 years and the shelf life of the PML is about 3 years. For such a long stowage time to be achieved, the storage temperature should not exceed 52° C (125° F), and the original shipping package should be intact.

077-2.5.3.4 Maintenance of Chemical Lights. Inspect chemical lights in accordance with PMS requirements. Dispose of used lights and replace. Replace unused light sticks on a regular basis according to the expiration date. Light sticks that have exceeded their shelf life can be used in repair lockers for damage control exercises.

077-2.5.4 WHISTLES. The life preservers equipped with whistles are indicated in Table 077-2-2. The whistle is used to guide rescuers.

077-2.5.4.1 Construction. Life preserver whistles are olive drab plastic police-type or flat orange type construction. The AIULP and MK 1 life preservers are required to be equipped with the flat, orange whistle. All other preservers may use the orange whistle as an option.

077-2.5.4.1.1 With the exception of the AIULP and inflatable MK 1 life preservers, whistles are attached to the distress marker light loop by a lanyard. The orange whistle is secured to the AIULP and MK 1 life preservers with a lanyard and stowed in a pocket when not in use. The lengths of the lanyard and the attachment methods are provided in PMS requirements.

077-2.5.4.2 Maintenance. Inspect the whistle in accordance with PMS requirements. If the whistle doesn't work or is damaged, replace it immediately.

077-2.5.5 REFLECTIVE TAPE. Inspect all inherently buoyant (except yoke type) life preservers, inflatable MK 1 life preservers, orange abandon-ship life preservers with pouch, AIULP life preservers, and ring buoys in accordance with PMS requirements to determine condition of the reflective tape.

NOTE

Return the AIULP to the issuing site if reflective tape is missing upon initial receipt.

077-2.5.5.1 Replace any missing or damaged tape. Use 2-inch wide adhesive reflective tape. The tape requires a primer. Place replacement tape where the missing tape was located. Inherently buoyant life preservers with collar and abandon-ship life preservers, supplied from older stocks, may be received without reflective tape. In these cases, locate areas for tape placement, as shown in Figure 077-2-17 and Figure 077-2-18. Install the tape in accordance with the following procedure:

1. The reflective tape can be attached to the inherently buoyant life preserver with collar without removing the pads. Inflate the abandon-ship life preserver orally until very firm. Do not attempt to apply the tape when the temperature is below 4° C (40° F).
2. Lay reflective tape on the life preserver or ring buoy in specified areas, marking tape placement locations with chalk.
3. Brush coat the adhesive primer on the inside of the marked area. Allow a narrow border of primer to extend beyond the edges of the marked area.
4. Let the adhesive primer air dry completely. Air drying time (10 minutes minimum) depends on temperature and thickness of primer coating. To ensure primer is completely dry, test by touching with finger. No adhesive strings should be noticeable.
5. Separate 1/2- to 1- inch of protective backing from one end of the reflective tape. Bend tape backing back on itself.
6. Position reflective tape over the marked area. Avoid allowing exposed adhesive surface on tape to touch the primed area.
7. When the tape is properly aligned, press the exposed adhesive surface of the tape onto the primed area, smoothing from the center to the outside edges of the tape to remove air bubbles.

8. Working toward the other end of the tape, remove the protective paper in small increments and press the reflective tape onto the primed area. Smooth from the center to the outside edges of the tape to remove air bubbles.

9. When all tape is firmly secured to the preserver, dust reflective tape areas with talc to eliminate possible adhesion of excess primer.

077-2.5.6 SEA-DYE MARKER. The sea-dye marker provides a means to detect persons on the surface of the water during daylight. Life preservers equipped with a sea-dye marker are indicated in Table 077-2-2. Ensure the sea-dye marker is attached to the various types of life preservers, in accordance with PMS requirements.

077-2.5.6.1 Maintenance. Inspect the sea-dye marker in accordance with PMS requirements.

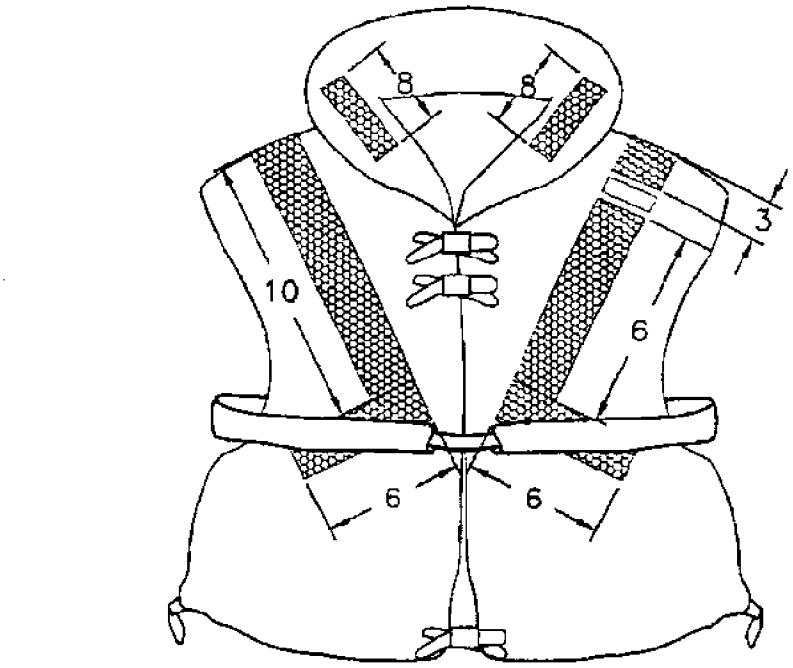
077-2.6 AUXILIARY EQUIPMENT

077-2.6.1 TYPES. The auxiliary equipment used by the Navy is intended to save lives. In addition to life preservers, the following auxiliary life saving equipment is also available to ship's force:

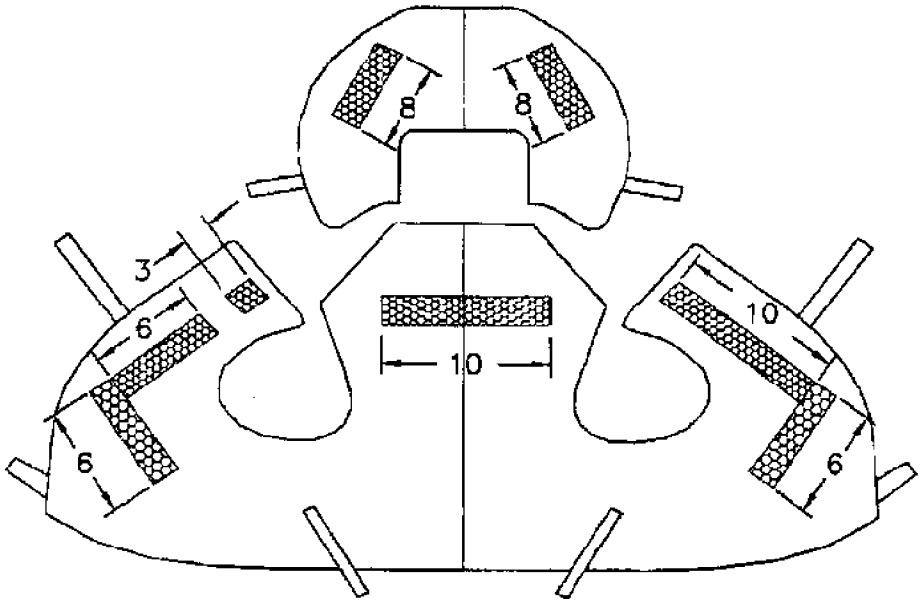
a. Inherently buoyant ring buoys, with and without lights.

b. Inflatable ring buoys.

c. Retrieving lines.



Front View



Rear View

Notes:

1. *Not to Scale.*
2. *Dimensions are in Inches.*

Figure 077-2-17. Reflective Tape On Inherently Buoyant Life Preserver with Collar

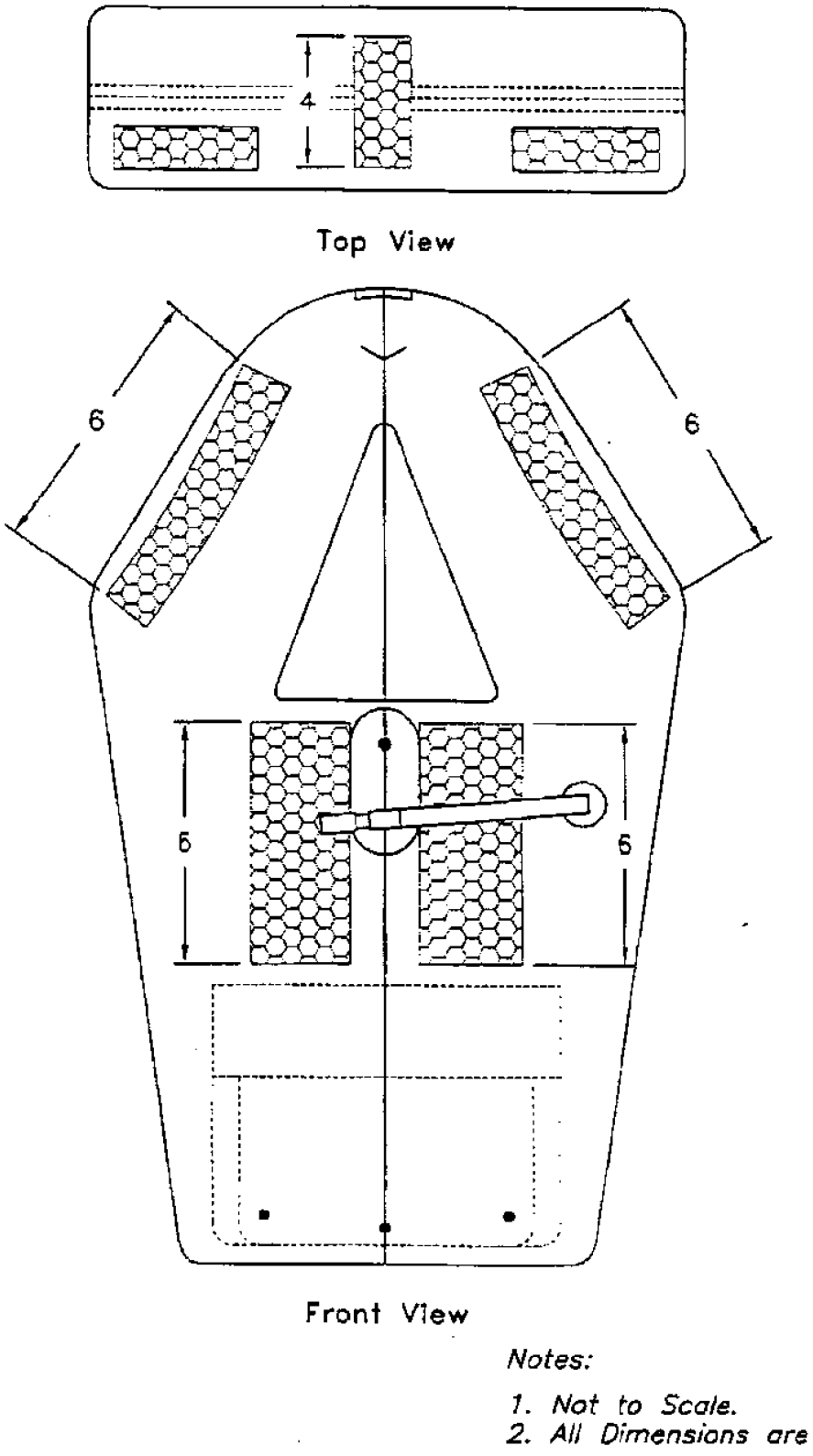


Figure 077-2-18. Reflective Tape On Abandon-Ship Life Preserver with Pouch

077-2.6.1.1 These auxiliary life saving devices are located at designated areas throughout the ship.

077-2.6.1.2 A training program should be instituted aboard all ships to acquaint ship's force in the use, handling, and stowage locations of all ring buoys and associated life saving devices. This training program should stress reliance on the equipment available and of dangers that can arise from pilferage of such items as float lights and retrieving lines.

077-2.6.1.3 The training program should include instructions on the following:

a. Tossing the inherently buoyant ring buoy.

b. Two handed toss of the ring buoy with light.

c. Overboard drop technique for ring buoy with light.

d. Tossing of the inflatable ring buoy.

077-2.6.2 INHERENTLY BUOYANT RING BUOYS AND RING BUOYS WITH LIGHTS. Inherently buoyant ring buoys (Figure 077-2-19) are available with or without lights. Ring buoys with lights are used as floating distress signals. Inherently buoyant ring buoys are available in three different sizes. The dimensions are given in Table 077-2-3.

077-2.6.2.1 Construction. Ring buoys are constructed of orange plastic material. A life line on the outer perimeter is attached to the ring at four locations by straps. Attach a retrieving line to the ring buoy life line. The length of the line shall suit the freeboard of the ship. The only markings on the ring buoys shall be the ship's name and hull number. The markings shall be distinguishable, black, block letters. Reflective tape shall be installed by ship's force, as shown in Figure 077-2-19. Use 2-inch wide adhesive reflective tape and primer described in paragraph 077-2.5.5. Paint over the tape or remove it during wartime.

077-2.6.2.2 Ring Buoy with Light. This is a standard inherently buoyant ring buoy with a light attached. This ring buoy is used as a floating distress signal. The ring buoy light will float upright in the water. The light is equipped with a magnetic switch which turns it on when upright in the water. A four-foot lanyard of 1/4-inch diameter polyethylene line is used to attach the light to the ring buoy.

077-2.6.2.2.1 The light is self-contained, watertight, and vapor proof. The power source for the light is a battery inside the case. The ring buoy light has an orange plastic case which is 30-1/2 inches long. A clear dome-shaped lens is located on top and covers a lamp.

NOTE

A 2-inch wide strip of reflective tape should be placed completely around the light case near the lens.

077-2.6.2.3 Stowage of Ring Buoys. The buoy light and the mounting bracket for stowage are corrosion resistant. Ring buoys shall be available topside in the quarterdeck area, to personnel working over the side, and on paint floats alongside the ship. Stow ring buoys with lights at all man-overboard and replenishment stations. On submarines, provide ring buoys topside when surfaced for a prolonged period of time.

077-2.6.2.3.1 Locate ring buoys on the inboard side of life railings, bulwarks, and life lines. It is desirable that ring buoys be located where sheltered from salt water and severe weather conditions.

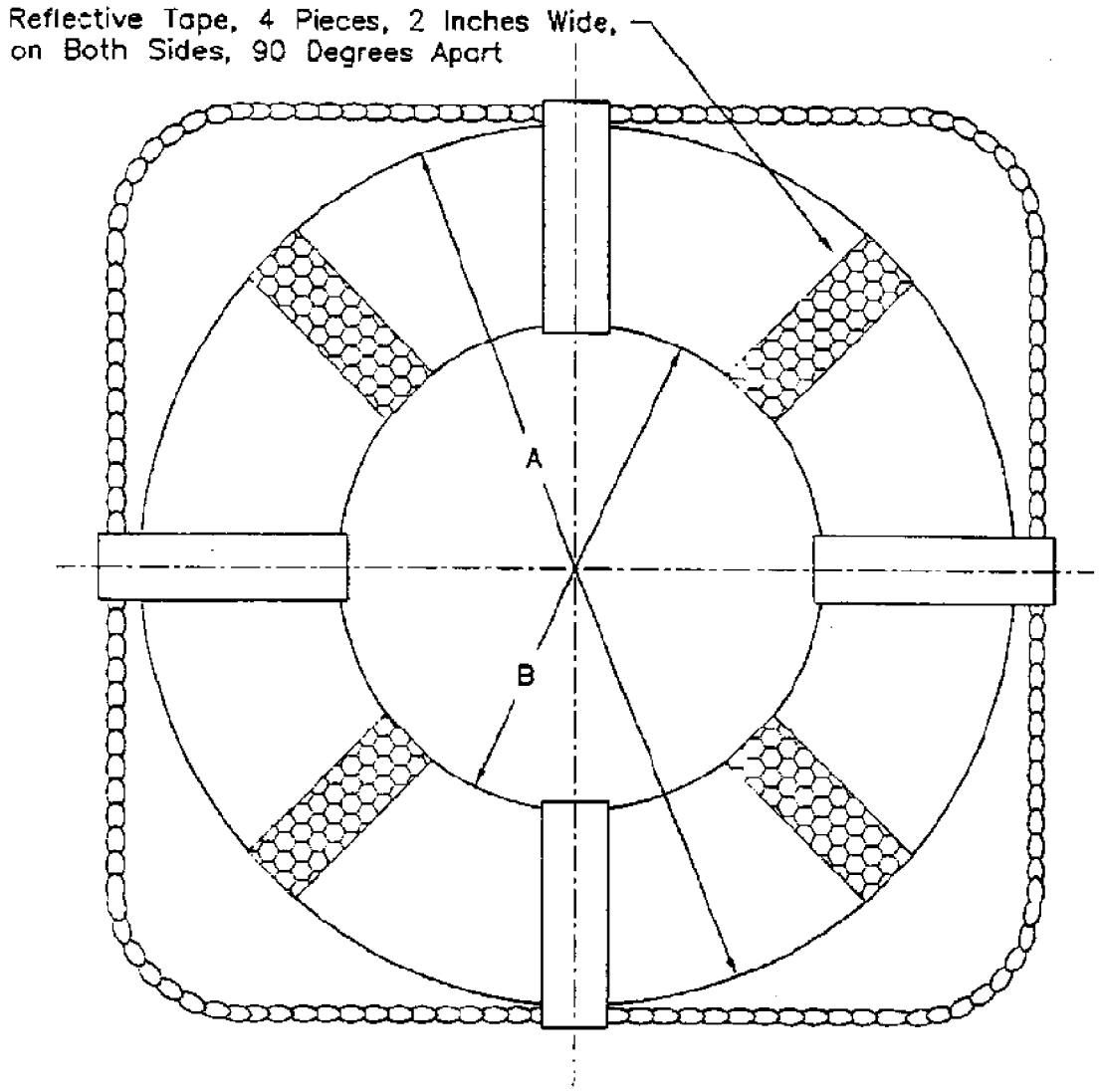


Figure 077-2-19. Inherently Buoyant Ring Buoy

Table 077-2-3. DIMENSIONS OF INHERENTLY BUOYANT RING BUOY

Dimensions (Inches)		
Size	**A**	**B**
20 Inch	20	11
24 Inch	24	13
30 Inch	30	17

077-2.6.2.3.2 If the ring buoy has a light attached, stow the light inverted in the mounting bracket provided. This causes the magnetic switch to open, turning the light off. The bracket is designed so the ring buoy light will release with a pull of 20 to 40 pounds of force.

077-2.6.2.4 Maintenance of Ring Buoys. Conduct regularly scheduled maintenance of ring buoys and retrieving lines in accordance with PMS requirements. Immediately repair or replace damaged ring buoys. The retrieving line should be neatly coiled so that it is easily uncoiled for use. The coil should be lashed with an easily broken cotton line.

077-2.6.2.5 Battery Replacement. Ring buoy light batteries should be replaced in accordance with PMS requirements. When the battery is changed, ensure the rubber gasket was replaced before screwing the lens tightly into place.

077-2.6.3 INFLATABLE RING BUOYS. This ring buoy inflates to a 21-inch ring buoy. The inflatable ring buoy is contained in a pouch which can be thrown (football style) with reasonable accuracy up to approximately 60 feet. Inflation is achieved with a water activated, automatic CO_2 inflation system. The buoy can also be manually activated. An oral inflation tube is provided if the CO_2 inflation system fails or additional inflation is desired. It is carried, in addition to the standard ring buoy, in boats and at deck recovery and quarterdeck watch stations.

077-2.6.3.1 Operating Instructions. Throw the ball-shaped pouch up wind or up current of the person needing help so that it will drift toward the person. Avoid throwing the pouch directly at the person. The ring buoy may hit the person and cause injury.

077-2.6.3.2 Stowage. Stow the inflatable ring buoy in ready-use lockers in boats and at deck recovery and quarterdeck watch stations.

077-2.6.3.3 Maintenance. Conduct regularly scheduled maintenance of the inflatable ring buoy and pouch in accordance with PMS requirements. Immediately repair or replace damaged ring buoys.

SECTION 3.

BREATHING APPARATUS AND EQUIPMENT

077-3.1 INTRODUCTION

077-3.1.1 This section covers the following respiratory protection equipment:

a. Oxygen Breathing Apparatus (OBA)

b. Emergency Escape Breathing Device (EEBD)

c. Supplementary Emergency Egress Device (SEED)

d. Emergency Air Breathing Stations and Air-Line Mask

e. Compressed Air Self-Contained Breathing Apparatus

f. Supplied Air Respirator With Backup Self-Contained Breathing Apparatus (SAR/SCBA).

077-3.1.2 Each piece of equipment is described along with its intended purpose, and directions are provided for use and care. Table 077-3-1 summarizes the situations for which the equipment is approved for use. Unless specifically authorized by Table 077-3-1, use only respiratory protection equipment approved by the National

Institute for Occupational Safety and Health (NIOSH) and only for the purpose and exposures for which the equipment is tested and approved. The definitions in paragraphs 077-3.1.3 through 077-3.1.4 apply to the situations covered in Table 077-3-1.

077-3.1.3 An emergency or casualty situation is one requiring immediate action to prevent personnel injury or equipment damage. Examples are fire, flooding, and personnel rescue.

077-3.1.4 A non-casualty situation is one which does not require immediate action to prevent personnel injury or equipment damage. Examples are spray painting and entering a void space. An emergency or casualty situation may be downgraded to a non-casualty situation by the on-scene commander once the emergency or casualty has stabilized and there is no additional immediate action required to prevent personnel injury or equipment damage.

077-3.1.5 Immediately Dangerous to Life and Health (IDLH) is defined in **NSTM Chapter 074, Volume 3, Gas Free Engineering** .

077-3.1.6 In non-casualty situations, a Gas Free Engineer shall carefully evaluate all exposures or potential exposures before proper respiratory protection equipment is selected.

077-3.1.7 All personnel using respiratory protection equipment in non-casualty situations shall be medically qualified and fit-tested in accordance with the requirements of OPNAVINST 5100.19B, Chapter B6.

077-3.2 OXYGEN BREATHING APPARATUS (OBA)

077-3.2.1 OVERVIEW. The Oxygen Breathing Apparatus (OBA) is a self-contained, closed circuit device which generates oxygen and allows the wearer to breathe independently of the surrounding atmosphere. Oxygen is generated by chemicals contained in a canister. The effective time limit of the oxygen supply is in excess of 45 minutes. Set the timer on the OBA for 30 minutes to allow 15 minutes to leave the area and return to fresh air.

077-3.2.2 GENERAL. When in operation, the air within the apparatus is continuously replenished with oxygen while exhaled carbon dioxide (CO_2) and water vapor are removed by the chemicals in the canister. As a result of this chemical action, the OBA wearer may survive and work in a toxic atmosphere such as a smoke filled compartment. With the facepiece and canister in place, the OBA forms, with the wearer, a closed, self-sustaining system.

Table 077-3-1. AUTHORIZED BREATHING DEVICES

Breathing Device	NIOSH Approval Required (Note 1)	Approved for Use in the Following Situations (Note 2)	
		Emergency/ Casualty	Non-Casualty
Self-Contained Breathing Apparatus	No	Yes	No
• OBA (paragraph 077-3.2)	Yes	(Note 4)	Yes
• Compressed Air (paragraph 077-3.6)		Yes (Note 4)	(Note 3)

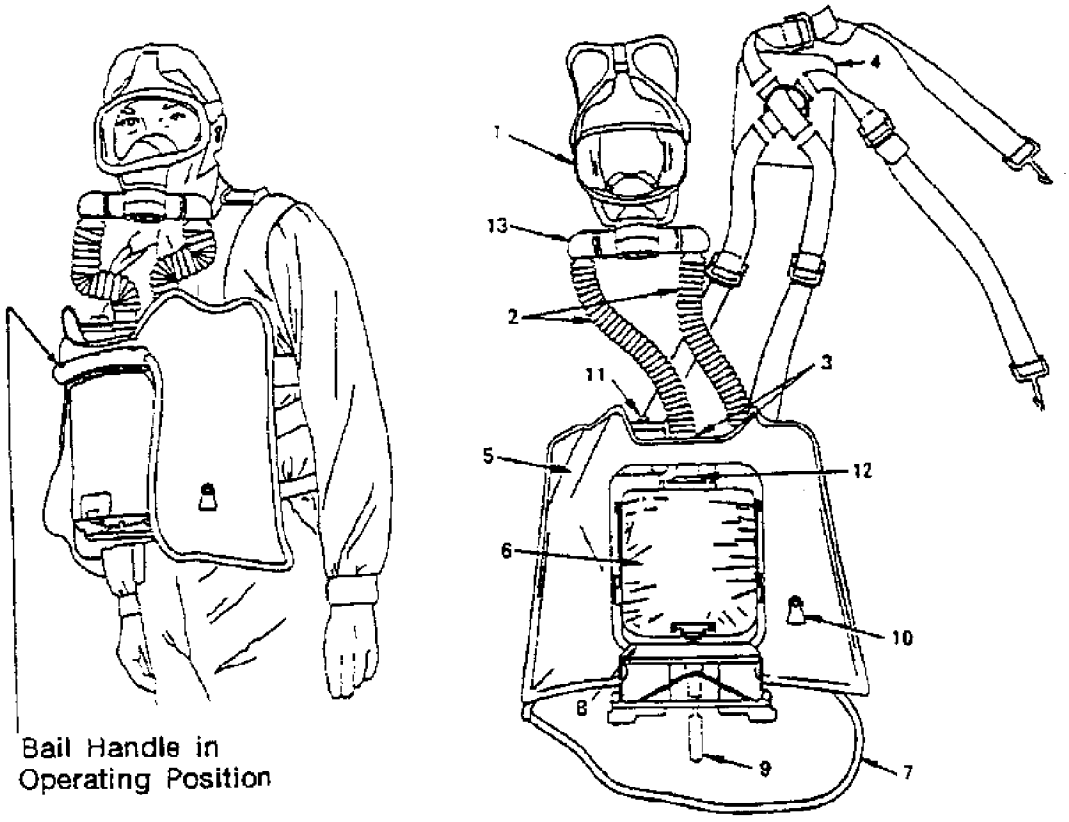
Table 077-3-1. AUTHORIZED BREATHING DEVICES - Continued

Breathing Device	NIOSH Approval Required (Note 1)	Approved for Use in the Following Situations (Note 2)	
		Emergency/ Casualty	Non-Casualty
Air-Supplied Respirators	No	Yes	No
• EAB-Submarine (paragraph 077-3.5)	No	(Note 5) Yes	No
• EAB-Surface Ship (paragraph 077-3.5)		(Note 6)	
EEBD (paragraph 077-3.3)	No	Yes (Note 7)	No
SEED (paragraph 077-3.4)	No	Yes (Note 7)	No
SAR/SCBA (paragraph 077-3.7)	Yes	Yes (Note 4)	Yes (Note 3)

Note 1. If "Yes" is indicated below, the specific respiratory equipment must be approved by the National Institute for Occupational Safety and Health. NIOSH approved equipment is physically marked to indicate approval.
Note 2. The situations listed below are defined in paragraphs 077-3.1.3 and 077-3.1.4.
Note 3. In a non-casualty situation involving a known or potential Immediately Dangerous to Life and Health (IDLH) atmosphere, the following priority shall be observed when selecting a respirator. IDLH atmospheres are defined in **NSTM Chapter 074, Volume 3, Gas Free Engineering** .
1. SAR/SCBA
2. Compressed air, self-contained breathing apparatus
Note 4. In an emergency/casualty situation involving a known or potential IDLH atmosphere, the following priority shall be observed when selecting a respirator:
1. SAR/SCBA
2. Compressed air, self-contained breathing apparatus
3. OBA
Note 5. Used to take immediate action until relieved by damage control personnel wearing SCBA's or OBA's. Used whenever the atmosphere is contaminated by smoke, toxic fumes, airborne radioactive contamination, or dust.
Note 6. Used in emergency situations when an extended stay in a compartment containing unbreathable air is necessary.
Note 7. Used to escape from atmospheres where respiratory protection is necessary.

077-3.2.3 TRAINING. Before the OBA is used in a damage control operation or other emergency, familiarize personnel thoroughly with its principles of operation and the procedures and precautions for use. Practice OBA use frequently under supervision of a qualified operator. Instructions for use of the OBA are given in paragraphs 077-3.2.5 through 077-3.2.6.3.

077-3.2.4 DESCRIPTION. The Navy Type A-4 OBA is illustrated in Figure 077-3-1 with its important parts identified. On the left, the illustration shows the Type A-4 OBA as it is worn. Lower center is an optional spectacle kit which allows use of eye glasses in the facepiece. For additional details on the spectacle kit and the OBA, see the Type A-4 OBA technical manual (NAVSEA SS600-AA-MMA-010/A-4). Submarines are authorized use of P-3 wire frame glasses in lieu of spectacle kit. Combat spectacles used with MCU-A/P or MCU-2A/P chemical protective masks are authorized for use by submarines and surface ships in lieu of the spectacle kit.



1. Facepiece
2. Breathing Tubes
3. Breathing Tube Couplings
4. Body Harness and Pad
5. Breathing Bag
6. Breastplate Assembly
7. Waist Strap
8. Bail Assembly Handle
9. Canister Release Strap
10. Canister Relief Valve and Pull Tab
11. Timer
12. Plunger Assembly
13. Valve Assembly

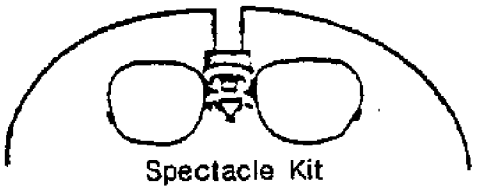


Figure 077-3-1. Navy Type A-4 Oxygen Breathing Apparatus

077-3.2.4.1 Key OBA Components. (See Figure 077-3-1 and Figure 077-3-2)

a. A quick starting canister containing chemicals which generate oxygen for breathing and remove CO_2 and water vapor from the exhaled air. The canister also contains an oxygen generating candle for quick starting.

b. A rubber facepiece with adjustable harness and breathing tubes.

c. Breathing bags for storing reserve air that has been made ready for breathing. The breathing bags and breathing tubes also serve to cool the air stored in the OBA. The breathing bags are equipped with a pressure relief valve to relieve excess pressure.

d. A timing device to warn the wearer to exit the space before the canister chemicals are used up.

077-3.2.4.2 Quick Starting Canister. The canister incorporates an oxygen generating candle which supplies oxygen until normal oxygen generation begins. Normal oxygen generation occurs when the wearer exhales moisture and CO_2 . The rate of oxygen generation is proportional to the amount of CO_2 and moisture in the exhaled breath. The quantity of moisture and CO_2 in the exhaled breath is determined by how hard the wearer is working.

077-3.2.4.2.1 Canisters used for the Type A-4 OBA have a curved shape. The curved shape allows the canister to be inserted into the OBA in only one way. In addition, the back of the canister for the Type A-4 OBA has horizontal ribs and a label to identify the back side from the front side.

077-3.2.4.3 Facepiece. The facepiece is made of rubber in a face seal configuration. The facepiece contains a single, wide angle lens made of scratch resistant plastic. The wide angle lens provides good vision and reduces any claustrophobic effect. The facepiece also contains a speaking diaphragm and a rubber nose cup. Air is drawn from the inhalation tube into the facepiece through flapper check valves in the nose cup and is exhaled through an opening inside the nose cup. This opening leads to a combination valve assembly immediately below the speaking diaphragm which contains the inhalation and exhalation flapper check valves. The inhalation tube is attached to one end, and the exhalation tube is attached to the other end of the combination valve assembly.

077-3.2.4.4 Timing Device. The OBA contains a timing device to warn the wearer to return to fresh air. The dial is graduated in minutes and may be set for any fraction of 60 minutes. To set the timer, the dial first needs to be turned to 60 minutes to fully wind the timer, then the timer can be set to 30 minutes. The completely wound timer bell will ring for several seconds when the set time has expired. When the pointed end of the timer knob is pointing directly away from the body, the warning bell will ring. When the bell rings, start leaving the area to replace the canister in fresh air.

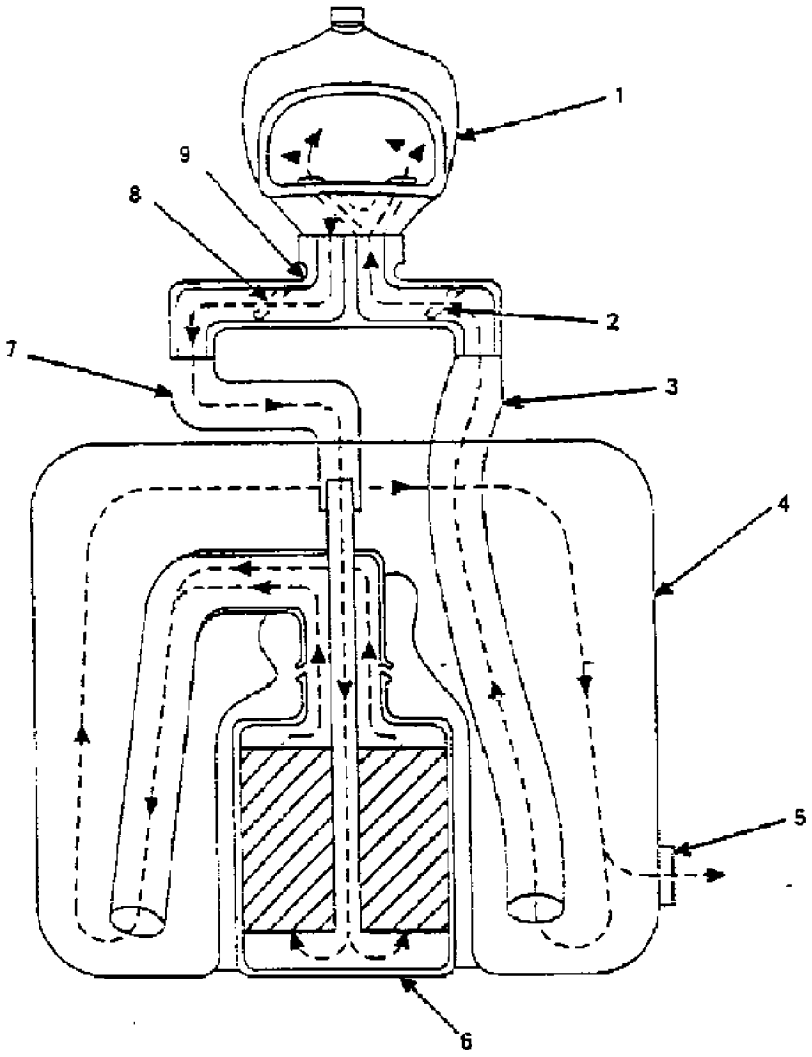
077-3.2.4.5 Air Flow. The flow of air within the Type A-4 OBA is illustrated in Figure 077-3-2. The course the air takes is as follows:

a. Exhaled air flows down from the facepiece through the exhalation valve and tube to the canister, where it flows through a central tube to the bottom of the canister.

b. The exhaled air then rises through the chemicals in the canister. The chemicals remove CO_2 and moisture while generating oxygen.

c. The air from the canister flows into the breathing bags and then through the inhalation tube and valve to the facepiece.

d The automatic pressure relief valve relieves excess pressure in the breathing bags.



1. Facepiece
2. Inhalation Valve
3. Inhalation Tube
4. Breathing Bag
5. Pressure-Relief Valve
6. Canister
7. Exhalation Tube
8. Exhalation Valve
9. Valve Assembly

Figure 077-3-2. Navy Type A-4 Oxygen Breathing Apparatus Air Flow Diagram

077-3.2.5 DONNING AND ADJUSTING. The following are the steps for donning and adjusting the Type A-4 OBA (terms used are defined in Figure 077-3-1 and Figure 077-3-2):

CAUTION

Do not raise the bail handle from the standby position to the operating position without first properly inserting a canister into the apparatus. Raising the bail handle without a properly inserted canister may damage both the plunger assembly and guide rods.

NOTE

While all of the following donning and adjusting steps can be done by the wearer, assistance will significantly speed up the process and provide additional assurance that the OBA has been properly donned and adjusted. However, since help is not always available, wearers shall be able to don and adjust the OBA without assistance.

1. Check that the bail assembly handle is down and locked in the standby position.
2. Attach facepiece breathing tube quick-disconnect couplings (if unattached) to the apparatus as follows:

NOTE

Couplings are different sizes and color-coded to ensure proper assembly. It is possible to slide the larger coupling on the smaller nipple, but it will not latch or seal. The OBA will not function if the couplings are not properly installed.

a Fully retract spring loaded outer sleeve of coupling, exposing ball bearings.

b Push couplings firmly over nipples (black onto black and blue onto blue).

c Release spring loaded outer sleeve.

d Test connection. Grasp hose at clamp and pull lightly. If put on correctly, coupling will not pull off.

3. Fully extend and straighten all body harness and waist straps. Extend facepiece head straps and place harness strap assembly in front of the facepiece lens.
4. With one hand, grasp facepiece by the combination valve assembly and the apparatus by the bail handle. With the other hand, grasp the body straps of the body harness and pad. Bring pad and harness over the head and position OBA on chest.

NOTE

In some situations, such as a rolling ship in heavy seas, it may be necessary for the user to have one hand free to help maintain balance. In this case the OBA can be positioned on the chest by grasping the cross bar with one hand, looping the index finger of that hand through a head harness strap, looping the thumb of that hand through the D-ring on the body harness and lifting the OBA into posi-

tion. Release the D-ring and with the other hand drape the body harness pad assembly over your head and the facepiece behind your head. It is essential that the facepiece not be allowed to be suspended by the breathing tubes. If necessary obtain assistance in donning the OBA.

5. Run the underarm straps under the arms and attach snap hooks to the rings on the top corners of the breastplate assembly.

6. Position breastplate so the breathing tube quick-disconnect couplings are slightly below the shoulders. While apparatus is held in position, adjust the underarm straps and then the shoulder straps until apparatus is fitting comfortably. When adjusted correctly, the harness pad is located in the top center of the back, and head movement is not restricted when the facepiece is donned.

7. Place the facepiece over and behind the head so it is out of the way.

NOTE

Use of the waist strap is optional. Allowing the OBA to hang freely from the body harness may provide greater mobility in normal use, and help to prevent inadvertent bag deflation.

8. Snap waist strap to the bracket on lower side corner of the breastplate. Adjust this strap to hold apparatus snugly to the body. Wrap excess strap under the secured part of the strap. If there is excess strap from the underarm straps, secure these under the waist strap.

NOTE

The waist strap can be quickly adjusted by changing the size of the waist strap loop. A nylon tie wrap attached to the loop will prevent the loop from being accidently pulled out.

9. Install canister in accordance with the following procedure:

   a Remove canister tear-off cap and aluminum protective disk by pulling tab backward and downward. This exposes the copper foil seal and O-ring. Discard cap and aluminum disk. Inspect copper foil seal and O-ring to ensure both are intact. Do not puncture the copper foil seal.

WARNING

Do not pull the lanyard when removing candle cover. Pulling the lanyard removes the cotter pin, which fires the candle and oxygen is generated. The cotter pin and candle cover are shown in Figure 077-3-3. If the canister is fired while the copper foil seal is still in place, pressure will build in the canister causing the copper foil seal to rupture.

   b To remove candle cover, hold canister upside down and rotate swivel plate 180 degrees. Pull swivel plate up and toward center of canister. This is illustrated in Figure 077-3-3. Leave cover dangling from lanyard. Do not pull lanyard.

WARNING

Do not use an OBA which pierces the foil seal in the standby position. If the canister copper foil seal is pierced when the canister is placed in the standby position, adjust the standby stop in accordance with the OBA technical manual.

c With the bail handle locked in the standby (down) position, insert the canister upward into the guard, with the neck up and the concave, ribbed side toward the body. The canister is correctly inserted when it is firmly retained by the canister retaining mechanism.

10. The OBA may be stowed with an anti-flash hood protecting the facepiece lens. Remove the hood from around the facepiece lens, valve assembly, and breathing tubes. If the anti-flash hood is to be worn with the OBA, don the anti-flash hood and pull the face opening over the head to around the neck. Don the facepiece as indicated in the following steps.

WARNING

If hair is allowed to penetrate the seal between the face and facepiece, it may result in loss of oxygen from the OBA and penetration of toxic fumes from the outside. To maintain an effective seal, the portion of the face contacting the seal shall be clean shaven.

a Insert chin into the facepiece chin stop.

b Pull head harness strap assembly from front of facepiece over head. Ensure that harness straps are laying flat against the head.

c First tighten both lower straps at the same time. Next tighten upper straps. Do not tighten forehead strap at this time.

d Place both hands on head harness pad (on back of head) and push it down toward neck.

e Retighten first the lower and then the upper straps.

f Tighten forehead strap if needed.

NOTE

When properly donned, both lower straps are tightened equally, both upper straps are tightened equally, the facepiece is centered on the face, and the head harness pad is centered squarely on the back of the head.

g Test facepiece sealing. To do this, squeeze the corrugated breathing tubes together tightly with one hand. The facepiece should collapse inward while breath is held. This indicates there is a gas tight seal. Hold breath for 5 seconds. If leakage is detected, readjust head harness straps. Test the facepiece seal each time facepiece is donned.

h Make final adjustments to all four body harness straps to ensure wearer will be able to look up or down without the facepiece shifting or breathing tubes catching on the timer.

i If going into a standby condition, loosen lower facepiece straps only. This allows wearer to remove facepiece and place it over and behind the head, out of the way until needed.

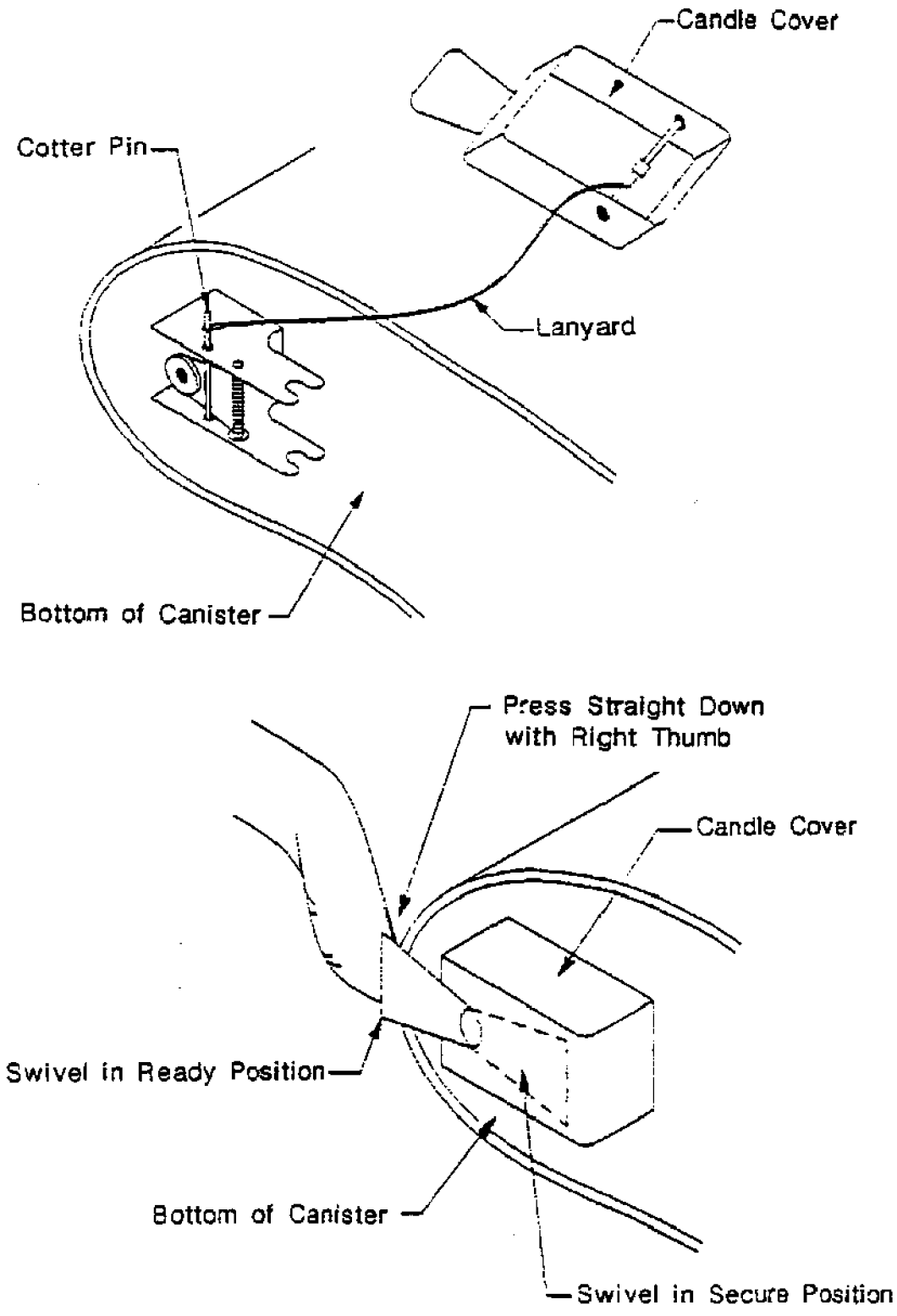


Figure 077-3-3. Candle Cover

077-3.2.6 PLACING OXYGEN BREATHING APPARATUS IN OPERATION.

077-3.2.6.1 Starting The OBA.

1. If in a standby condition, don facepiece and retighten the lower straps. Retest facepiece seal (see paragraph 077-3.2.5, step 10g).

CAUTION

If the metal canister cap has not been removed, attempting to raise the bail handle into the operating position may damage the plunger assembly.

2. Using both hands, depress tabs on bail handle to unlock bail assembly from the standby (down) position. Swing handle upward until it snaps into position. Ensure the handle is locked in position by trying to push the handle forward without depressing the tabs. The handle should not move.

3. Once step 2 is completed, the canister is ready to fire. Two methods to activate the canister may be used; candle start or manual start. The candle start method is the preferred method. The two methods are described as follows:

   a Candle Start. Pull canister lanyard out, away from the body. Hold lanyard up and visually inspect it to ensure that the cotter pin has been removed from the canister candle firing mechanism. If the cotter pin is attached to the lanyard, the canister has been fired. A small amount of harmless smoke may be present when the canister is fired.

NOTE

Should the lanyard break, the canister can be started by pulling out the cotter pin with a pair of pliers. Assistance should be obtained to remove the cotter pin in this manner.

   b Manual Start.

   (1) Grasp the combination valve assembly with both hands and pull facepiece away from face enough to break the mask's seal.

   (2) With facepiece pulled away from face, inhale deeply. Relax grip to allow facepiece to reseal on face.

   (3) Exhale forcefully into facepiece.

   (4) Repeat steps 1 through 3 until breathing bags remain full and oxygen is felt on face after exhaling.

   (5) Recheck facepiece seal (see paragraph 077-3.2.5 step 10.g).

4. Test breathing bag tightness. Depress the left breathing bag at the pull tab with the left hand, as shown in Figure 077-3-4. Simultaneously grasp and seal off both breathing tubes with the right hand while pressing against the right breathing bag with the right elbow, as shown in Figure 077-3-4. Compress the left bag at the pull tab so the relief valve does not lift during this test. This procedure tests the canister, tube connectors, and breathing bags for tightness. If the bags do not remain inflated during the test, determine the cause of the leak and correct prior to use.

WARNING

Do not pull breathing bag tab during normal operation. This will cause a loss of oxygen from the bag.

5. Breathe normally. The exhausted breath will cause a chemical reaction in the canister. This will generate new oxygen from the canister. There will be more oxygen in the bag than is required. Excess oxygen will vent from the bag automatically through the relief valve in the bag. If the relief valve should stick after extended stowage time, use the breathing bag pull tab to activate the relief valve. While pulling the tab, check the breathing bag with one hand to ensure bag does not deflate completely.

WARNING

Once the timer bell has sounded, start leaving the contaminated atmosphere area and return to fresh air.

6. Once the apparatus is inflated, working, and has been leak tested, set the timer. Rotate the timer knob clockwise to 60 minutes, then set the timer for 30 minutes. Rotating the timer knob to 60 minutes before setting the timer to 30 minutes is required to completely wind the timer bell.

NOTE

When the timer is set for 30 minutes, the pointed end of the timer knob will be pointing directly toward the wearer. During service, check the timer frequently by feeling the timer knob position. The pointed end of the timer knob will be pointed directly away from the wearer when the bell sounds.

NOTE

Table 077-3-2 shows a shortened OBA donning procedure. This table may be reproduced and positioned near OBA stowage locations for quick reference. Personnel shall be familiar with the complete procedures and precautions for OBA operation prior to using the short procedure.

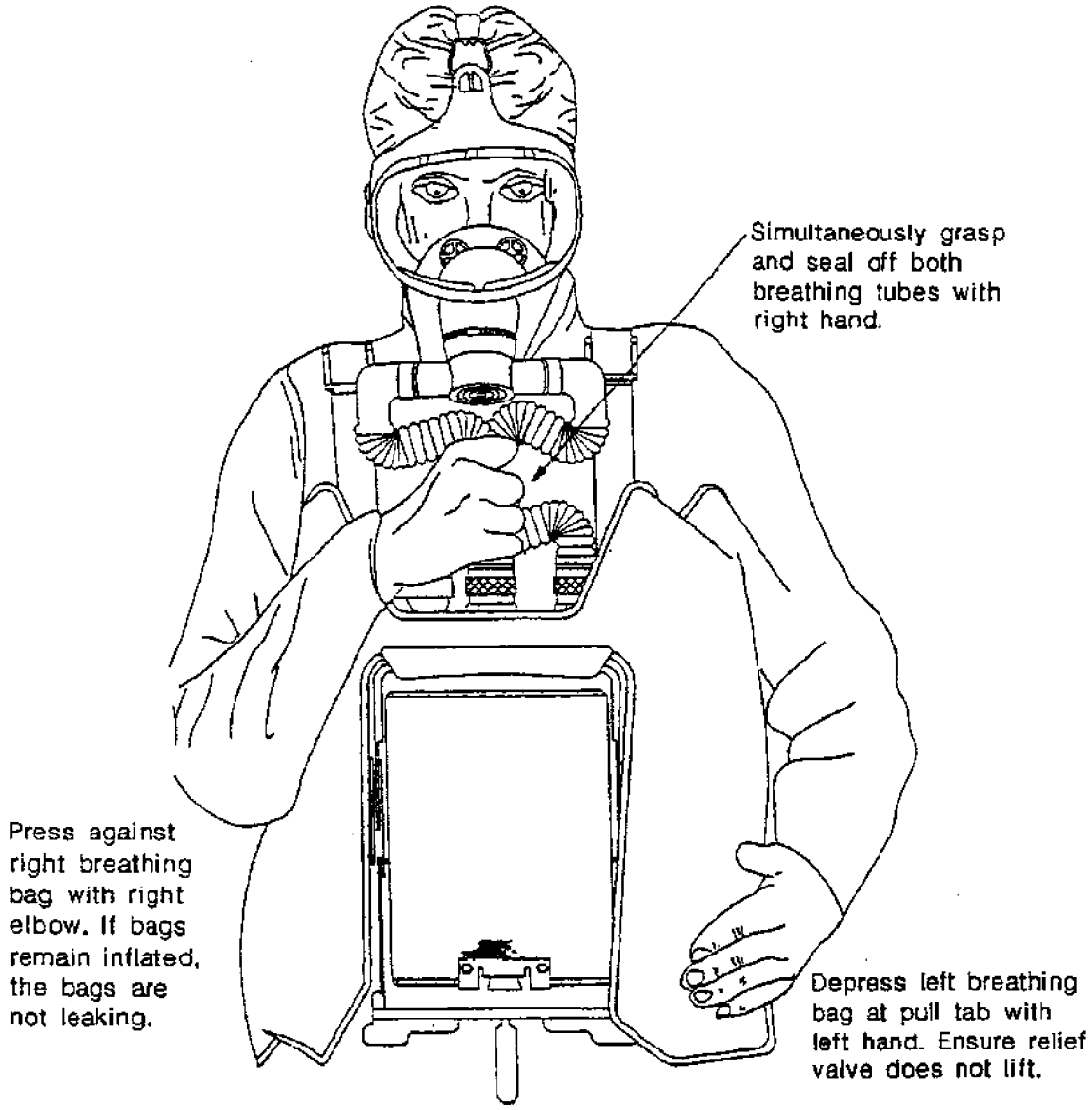


Figure 077-3-4. Testing Oxygen Breathing Apparatus for Leaks

077-3.2.6.2 Canister Removal. Remove canister in accordance with the following procedures:

WARNING

Do not attempt to touch canister during removal. Expended canisters are hot and will burn unprotected skin. In the event the expended canister cannot be disposed of after use and has to be temporarily stowed, exercise extreme caution when handling and stowing expended canisters. Never allow foreign material, particularly grease, oil, or water to enter neck of canister. Any of these substances can cause a violent chemical reaction and may even

Warning - *precedes*

cause the canister to explode. Take care to prevent entry of any foreign substances in expended canisters during temporary stowage.

1. If the canister has been used, remove facepiece and put it over and behind your head in the standby position. The facepiece may be left on if another canister is going to be inserted into the OBA immediately.
2. Depress tabs on the bail handle. This unlocks the bail handle allowing it to be pushed down. Push bail handle down from operating position to standby position. Loosen or disconnect the waist strap to allow OBA to swing away from body before pulling release tab. Spread legs apart, lean upper body forward, and pull canister release tab, while keeping hands away from the falling canister. The canister should drop out of OBA. If canister fails to fall out, shake the OBA. This should free the canister.
3. If the canister still fails to drop out of the OBA, insert a thin metal rod between the inhalation and exhalation tubes, pull the release tab, and attempt to force the canister out. If this does not free the canister, set the OBA aside and allow the canister to cool. Then remove the canister using gloves.

WARNING

Perform the leak test described in paragraph 077-3.2.6.1, step 4 each time a fresh canister is inserted and started. If the facepiece is removed, leak test the facepiece after putting it back on (see paragraph 077-3.2.5, step 10.g).

077-3.2.6.3 Canister Replacement. Replacement of quick start canisters while the OBA is in use, can be carried out indefinitely. Return to a non-contaminated atmosphere at the end of 30 minutes. Once in the non-contaminated atmosphere, replace the used canister with a new canister.

077-3.2.7 REMOVING OXYGEN BREATHING APPARATUS. To remove the OBA, use the following procedure:

1. The OBA may be stowed with an anti-flash hood protecting the facepiece lens.
2. Place the facepiece over and behind your head in the standby position and remove the canister.
3. Loosen waist strap then unhook waist strap.
4. Loosen shoulder straps and unhook underarm straps from the upper corners of breastplate assembly. Move facepiece to the vicinity of the bail handle and grasp facepiece and bail handle with one hand. Grasp shoulder harness, preferably at D-ring connector, with other hand and lift harness over head.
5. If wet or moist, wipe down OBA.
6. Always clean OBA and disinfect facepiece after each use in accordance with PMS requirements.

Table 077-3-2. SHORT PROCEDURE FOR DONNING THE A-4 OBA

THIS SIMPLIFIED PROCEDURE ASSUMES THE OPERATOR IS ALREADY FAMILIAR WITH THE COMPLETE PROCEDURES AND PRECAUTIONS FOR OXYGEN BREATHING APPARATUS OPERATIONS AS STATED IN NAVAL SHIPS' TECHNICAL MANUAL, CHAPTER 077.

Table 077-3-2. SHORT PROCEDURE FOR DONNING THE A-4 OBA -

Continued

1. DON REQUIRED PROTECTIVE CLOTHING (including anti-flash hood) prior to donning OBA.
2. VERIFY THE HEAD HARNESS STRAPS are fully extended and positioned in front of the facepiece.
3. PUT YOUR HEAD THROUGH THE ″V″-SHAPED OPENING OF THE SHOULDER STRAPS of the body harness.
4. ATTACH THE TWO UNDERARM STRAPS to the ″D″ ring on each side of the breastplate.
5. POSITION THE BREASTPLATE so the tube connections are slightly below the shoulders. Adjust the underarm straps first, then the shoulder straps for a comfortable fit. The harness pad should be located center of the back, down from the neck.
6. PLACE THE FACEPIECE OVER THE HEAD.
7. SNAP THE WAIST STRAP to the small eyelet on the lower breastplate and adjust to pull the apparatus snugly to body. Wrap the excess strap under the secured part of the strap to prevent snagging. (USE OF WAIST STRAP IS OPTIONAL).
8. REMOVE PROTECTIVE METAL CAP FROM CANISTER; ensure copper foil seal is not damaged and the rubber gasket is present.
9. REMOVE FIRING PIN COVER; let it hang by lanyard.
10. PLACE THE CANISTER IN THE OBA with canister neck up and concave side toward body.
11. DON AND ADJUST THE FACEPIECE:
a. Ensure anti-flash hood is down around neck.
b. Place facepiece over face and pull head harness straps over head
c. Tighten the neck straps.
d. Tighten the side straps.
e. Push head harness down toward neck.
f. Adjust all head harness straps again from the bottom.
12. TEST FACEPIECE FOR PROPER SEAL by squeezing both breathing tubes and inhaling gently; if not airtight, repeat step 11.
13. WHEN READY TO ENTER THE AFFECTED COMPARTMENT, prepare the canister for activation by depressing lock tabs and swinging the bail handle upward until it snaps into position.
14. ACTIVATE CANISTER. Pull the lanyard straight out from the body, removing the cotter pin or use manual start.
15. CHECK THE COMPLETE UNIT FOR TIGHTNESS before entering a toxic or potentially toxic atmosphere by doing the following at the same time:
a. Squeeze both breathing tubes together.
b. Depress the breathing bag at the relief valve pull tab.
c. Press against the breathing bag with elbow.
d. Ensure the breathing bags remain inflated.
16. WIND TIMER TO 60 minutes, then set at 30 minutes.

077-3.2.8 CANISTER DISPOSAL. Dispose of canisters when fully or partially depleted or when the copper foil seal beneath the tear-off cap has been punctured. Jettison canisters overboard when the ship is more than 25 nautical miles from shore. Before disposal, take care to prevent any foreign substance, particularly water, oil, oily water, or grease from entering the canisters.

WARNING

If necessary to puncture the copper foil seal, use a tool that is free of oil, grease, or gasoline. These substances will produce a violent reaction with canister chemicals and possibly an explosion.

077-3.2.8.1 Do not puncture sides or bottoms of canisters but ensure that the tear-off caps are removed and copper foil seals are fully punctured. This allows water to enter the canisters after they have been jettisoned overboard.

NOTE

If the canister tear-off cap has been removed, but the neck seal has not been damaged and the copper foil seal has not been punctured, the canister may be recapped for later use. Recap the canister with a new metal cap.

077-3.2.8.2 If the ship is within 25 nautical miles of shore or if it is impossible to dispose of used, unusable, and unfired (with punctured copper foil seal) canisters by jettisoning overboard (such as in a submerged submarine), do the following:

WARNING

Never handle opened canisters without suitable hand and eye protection (rubber gloves and goggles). The canisters contain caustic chemicals that will injure the skin or eyes. Do not allow these chemicals to come in contact with the person. Never allow expended or unexpended chemicals to spill from the canister. These chemicals may cause combustion of any flammable materials with which they are brought into direct contact, especially if the materials are moist. Clean up any spills immediately. Use a scoop made of metal or nonflammable material to clean up spill.

1. Place unusable and unfired canister in an empty, clean metal bucket, puncture the copper seal of the unusable or unfired canister, if not already punctured, then fire the candle. Set aside and let the canister produce oxygen from the candle for at least 15 minutes.
2. After cooling enough to be handled, recap canisters to be disposed with new metal cap.
3. Wrap canisters and any spilled canister chemicals in double poly bags. Stow the poly bag wrapped canisters in a dry, oil-free environment until proper at-sea or shore site disposal is possible. Stow bags in a manner to protect against tearing and heat sources that could melt or ignite the bag.
4. If step 3 cannot be achieved, stow canisters in sealed, clean, dry, and oil-free metal containers. Use only open head, closeable, drum-type containers with a gasket. Stow containers in a cool, oil-free space until proper at-sea or shore site disposal is possible.

077-3.2.8.3 Upon arrival in port, contact the department ashore responsible for hazardous waste management. Arrange for off loading of used or unusable OBA canisters.

077-3.2.9 PRECAUTIONS. The following precautions are for use with the OBA and quick start canister.

NOTE

Some of the items are repeated from previous sections for emphasis.

077-3.2.9.1 Oxygen Breathing Apparatus Precautions. Activate the OBA when ready to enter a compartment that has the possibility of a contaminated atmosphere. Ensure that the breathing bags are properly inflated before entering the compartment. If excessive time is needed for filling the bags or rapid deflation after filling occurs, conduct a leak check.

WARNING

Do not use an OBA for diving. Water entering through the facepiece and exhalation tube will react violently with the chemicals in the canister.

1. The oxygen breathing apparatus, when properly fitted and operated, forms a closed breathing loop with the wearer's respiratory system. In an emergency, it can be worn in partially flooded compartments; however, exercise caution when doing so. The danger of water entering through the seal at the canister neck is negligible. However, there is danger of a violent chemical reaction if water enters the canister through the facepiece and exhalation tube. Should the water level cover or partly cover the breathing bags, breathing will be more difficult. The added buoyancy at the wearer's chest will cause difficulty in balance and create a buoyant effect similar to that of a life preserver.

2. Before entering contaminated atmosphere, check the apparatus to make sure it is gas tight in accordance with the donning and placing into operation instructions. See paragraphs 077-3.2.5, step 10.g, and 077-3.2.6, step 4.

3. Once the apparatus is tight and inflated, set the timer. Turn the timer knob clockwise to 60 minutes and then turn it back to 30 minutes. Rotating the timer knob to 60 minutes prior to setting it to 30 minutes is required to fully wind the timer bell.

4. While in operation, frequently check the timer knob by feeling the pointed end. This is the best way to ensure that the timer is working and to check the remaining time, especially when there are high noise levels and poor visibility.

5. Take care to protect breathing bags, breathing tubes, and facepiece from damage. If any of these are torn or pierced while working in an unsafe atmosphere, cover damage with hand and return to fresh air immediately.

6. If canister is changed in fresh air without removing the facepiece, follow the canister starting and OBA leak checking procedures before leaving fresh air.

7. Never release the facepiece seal in an unsafe atmosphere even if inhalation becomes difficult. Check the breathing tubes to see if they are kinked and restricting air flow. If a kinked tube is not the problem, return to fresh air immediately and have the OBA thoroughly checked.

WARNING

Under no circumstances should the oxygen-producing candle be saved for emergency retreat from the compartment. Such practice is dangerous since candles have been known to misfire.

8. When the timer bell sounds, start returning to fresh air. Also return to fresh air if it becomes an effort to exhale or if the facepiece lens fogs up when inhaling.

077-3.2.9.2 Quick Start Canister Precautions. Stow canisters in a cool, dry place. Never stow canisters in the OBA. Do not remove tear-off cap until ready to insert the canister in the OBA.

1. Insert the canister in the OBA and lock the canister in the operating position before pulling lanyard to activate the canister. Never pull the lanyard until the canister has been inserted in the OBA and is in the operating locked position. If lanyard is pulled before the canister is inserted in the OBA or the canister is not in the operating locked position, the copper foil seal will blow out.
2. Never try to reuse a canister. Once the copper foil seal is pierced and the canister has been removed from the OBA, consider the canister expended.
3. Used canisters are very hot. Never handle them without suitable hand protection. Never allow any substance, particularly oil, water and oil mixtures, gasoline, or grease to enter the neck of the canister. A violent reaction occurs when these substances come in contact with the oxygen producing chemicals. Never hold your face over the canister opening.
4. Never handle opened canisters without suitable hand and eye protection (rubber gloves and goggles). The canisters contain caustic chemicals that will injure the skin or eyes. Do not allow these chemicals to come in contact with the person. Never allow expended or unexpended chemicals to spill from the canister. These chemicals may cause combustion of any flammable materials with which they are brought into direct contact, especially if the materials are moist. Clean the spill up immediately and dump overboard unless within 25 miles of land or in port. If within 25 miles of land or in port, seal the spilled material in a double poly bag and dispose of it in the same manner as expended OBA canisters. Use a dust pan or scoop made of metal or nonflammable materials to clean up spill.
5. Never paint canisters. Rotate canister stock to allow the older canisters to be used first or for training. Use canisters with paint peeling off for shipboard training.

077-3.2.10 STOWAGE. The following criteria and precautions shall be followed when stowing OBA's and canisters

077-3.2.10.1 The following are acceptable stowage arrangements listed in order of preference:

a. Stowed in dedicated OBA stowage lockers either inside or outside a damage control repair station.
b. Stowed vertically inside or outside a damage control repair station when dedicated OBA lockers are not available or practical. Locate OBA's where they are not subject to damage and are shielded by ship's structural members, when possible. OBA's shall be well supported and strapped in place by an elastic shock cord. Provide a separate support for the facepiece.

c. Stowed horizontally inside or outside a damage control repair station lying on a shelf, one high, with the face-piece on top.

d. Stowed in Navy Standard Aviator Kit Bags and hung from installed hooks. The body of the OBA and other heavy items are to be placed in the bottom with mask and breathing hoses on top. In the same bag, stowage is available for (2) canisters, (1) anti-flash hood, (1) pair anti-flash gloves, (1) pair firefighter gloves, and (1) firefighter helmet.

077-3.2.10.2 Stow OBA's in areas that are cool and dry. This prevents the buildup of moisture which causes mildew damage. Keep OBA's away from oil, paint, and greasy substances. These are harmful to materials used in the construction of the OBA. Report any OBA not correctly stowed to the Damage Control Officer.

077-3.2.11 OXYGEN BREATHING APPARATUS CANISTER TRAINING KITS. All personnel shall attend a training session on the use of the OBA in accordance with Type Commander instructions. Use the training kits for classroom training of personnel in the use of the OBA. The training kits are used to ensure complete and realistic training for all personnel.

NOTE

Training with quick-start canisters is highly recommended, as funding permits.

077-3.2.11.1 General. The fully assembled training canister provides identical operation to the quick-start canister. The training canister contains a replaceable candle and removable firing mechanism, and is designed for use by 40 trainees. Each candle provides a 5-minute supply of oxygen when fired. Insert a new candle in the canister for each trainee.

077-3.2.11.2 Illustrated Views. An exploded view of the training canister is provided in Figure 077-3-5. The firing mechanism assembly is illustrated in Figure 077-3-6.

077-3.2.11.3 Training Canister Kit Contents. In each training canister kit, the following items are included:

a. One red canister (quick-start canisters are green)

b. One storage plug

c. Forty oxygen candle assemblies

d. Forty tear-off caps

e. One firing mechanism assembly

f. One protective housing assembly

g. Spare items include:
   1 One storage plug
   2 One firing mechanism assembly
   3 Five protective housing assemblies

077-3.2.11.4 Training Canister Chemicals. The chemical in the training canister is not the same chemical used in the actual quick-start canister and only absorbs CO_2 . This chemical does not produce oxygen. The amount of chemical in the training canister is enough to absorb CO_2 for 40 trainees who are not performing any work.

077-3.2.11.5 Chemical Monitoring. A view window is provided on the training canister for checking the chemicals. If the canister view window changes from solid pink to a solid blue color, discard the canister. Also discard the training canister if it has been used by 40 trainees. See paragraph 077-3.2.11.12 for training canister disposal instructions.

077-3.2.11.6 Oxygen Candle. Oxygen used in the training canister is generated by a replaceable candle. The candle produces a 5-minute supply (10 liters) of oxygen. Oxygen generation starts within 15 seconds after the candle has been fired.

077-3.2.11.7 Oxygen Generation. Oxygen generation is started by firing the canister as you would a quick start canister. A small amount of harmless smoke may initially be present when fired. This is a normal condition and is a positive sign that the candle is working. Another sign that the candle is generating oxygen is the breathing bags inflating.

077-3.2.11.8 Charging Instructions for Training Canister. For initial use or reuse of the partially used canister, use the following procedure:

1. Remove cover from firing mechanism, then remove the mechanism and storage plug (see Figure 077-3-5). Save the storage plug, and reuse it when storing a partially used canister to prevent moisture from entering the canister body.

2. Insert the candle assembly into the candle recess in the canister. Ensure the gasket is laying flat against the bottom of the canister.

3. Ensure the firing mechanism is cocked and the cotter pin is in place. Place firing mechanism over the candle assembly with candle primer housing projecting through the center hole. Line the notches up with the tangs, as illustrated in Figure 077-3-6.

NOTE

Notches and tangs are positioned so the unit can be assembled only in the correct position.

4. Rotate firing mechanism clockwise to lock candle in place. Tighten until tangs are in contact with firing mechanism frame. Do not over tighten.

5. Fold lanyard into candle cover. Secure candle cover on firing mechanism frame.

6. The canister is now ready for use in the OBA.

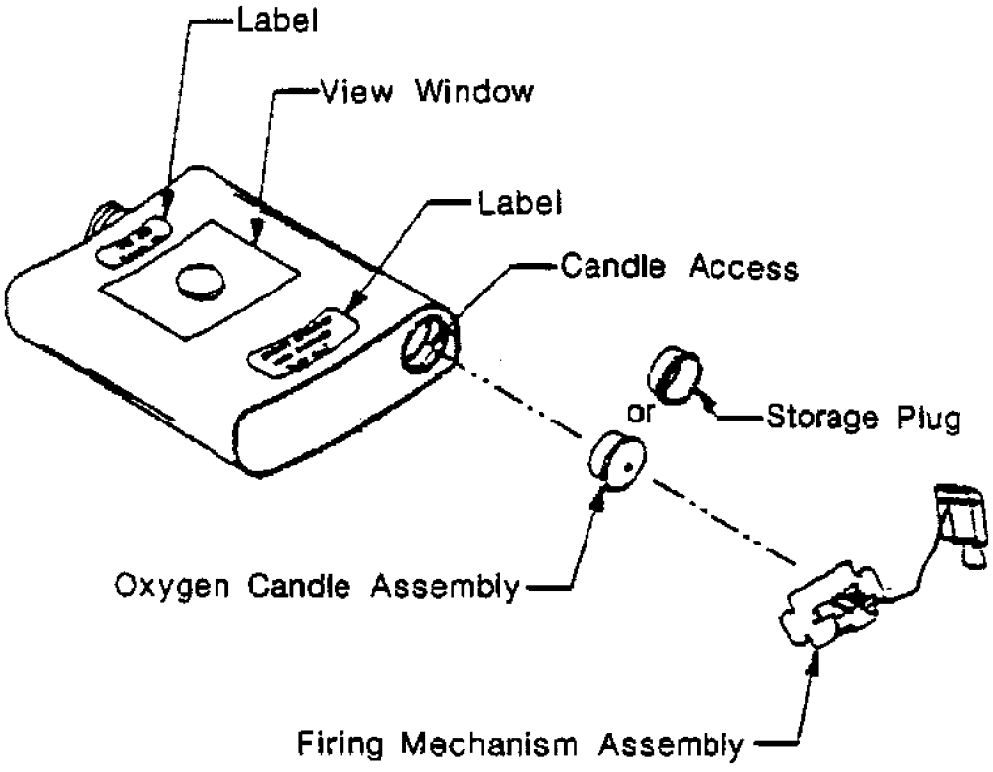


Figure 077-3-5. Exploded View of Training Canister Assembly

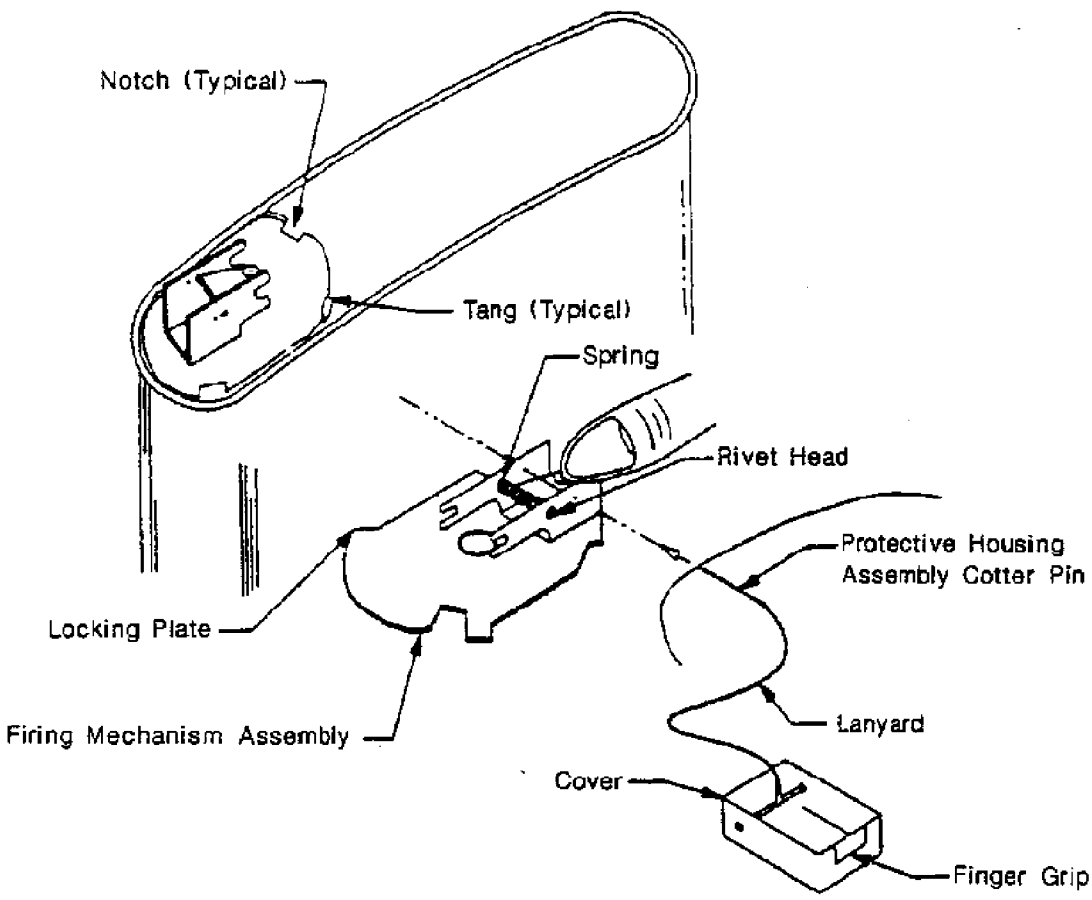


Figure 077-3-6. Detail of Training Canister Firing Mechanism Assembly

077-3.2.11.8.1 For canisters which have previously been fired, use the following charging procedure:.

1. Secure metal tear-off cap on the canister neck. Ensure hand tab is pointing toward instruction label on ribbed side of canister.

WARNING

The firing mechanism and candle will be hot after use. Wear gloves or allow items to cool before handling.

2. Remove firing mechanism from bottom of canister. To accomplish this, turn firing mechanism counterclockwise until tangs line up with notches.
3. Remove used candle and discard.
4. Hold firing mechanism with slotted end of frame pointing toward you. Raise firing hammer to cocked position.

5. While holding firing hammer in this position, replace the cotter pin through the holes in the frame from the same side (see Figure 077-3-6).
6. Install new candle and replace firing mechanism in training canister as described in paragraph 077-3.2.11.8, steps 2 through 6.
7. Don and adjust the OBA in accordance with the procedures contained in paragraph 077-3.2.5.

077-3.2.11.9 Starting the Training Canister. For starting the training canister, use the following procedure:

1. Remove the tear-off cap from charged canister. Pull the tab straight backward and downward. Remove the disk and aluminum protector to expose the rubber gasket.
2. To remove candle cover, hold canister upside down and rotate swivel plate 180 degrees. Pull swivel plate up toward center of canister. This is illustrated in Figure 077-3-3. Leave cover dangling from lanyard. Do not pull lanyard.
3. Insert canister, curved or ribbed side toward body, into the bail assembly. This is the standby position.
4. Don facepiece and adjust in accordance with paragraph 077-3.2.5, step 10. Check facepiece for airtight fit, as outlined in paragraph 077-3.2.5, step 10.g.
5. Depress tabs on bail handle and swing bail up to the locked operating position. Ensure bail handle is locked in position by pushing on the handle without pushing the tabs. The bail handle should not move.
6. Pull lanyard straight out away from the body. This removes the cotter pin and fires the candle, inflating the breathing bags with oxygen. Leak test OBA, as outlined in paragraph 077-3.2.6, step 4.
7. Set timer on OBA. Rotate timer knob to 60 minutes and return to 5-minute setting.
8. After training canister has been used for 5 minutes, remove canister. To accomplish this, depress tabs on bail handle and swing bail handle to the standby position. Loosen waist straps, spread legs apart, lean upper body slightly forward, and pull on canister release tab (see Figure 077-3-1). Canister will drop out of the apparatus.
9. If canister can be used for next trainee, recharge in accordance with paragraph 077-3.2.11.8.1.
10. Following each use of the training canister make a mark on the front of the canister with an indelible pen to indicate a use of the canister. When the canister has been used 40 times or the canister view window changes from a solid pink color to solid blue, dispose of the canister, as outlined in paragraph 077-3.2.11.12.

077-3.2.11.10 Stowage. Stow training canisters in kits and lock them in special lockers (NAVSEA Dwg. No. 804-2252162) or in locked compartments. Keep the kit locked up at all times, unless being used for training. The Damage Control Officer shall have control of the keys to ensure training canisters will not be used during actual emergencies.

077-3.2.11.10.1 After training is completed or if a break of more than an hour is taken, seal partially used canisters using the metal tear-off cap. Remove the oxygen candle and insert the plastic storage plug in the canister candle recess.

077-3.2.11.10.2 Return the partially used canister to the special locker or compartment and lock it up. Inspect all components to ensure that they are protected from moisture, which will cause deterioration. If lockers are not provided, stow canisters in a locked, dry, cool storeroom.

077-3.2.11.11 Precautions for the Training Canister. Observe the following precautions when using the OBA training canister:

077-3.2.11.11.1 This type of canister is for OBA TRAINING USE ONLY. Never use the training canister during actual emergencies. Simple exercises can be performed while the unit is in use for training purposes. Charge the training canister with a fresh candle prior to each use and only use it in the presence of an instructor. Personnel experienced and qualified in the use of an OBA shall act as instructors. The use of the training canister by any trainee shall never exceed 5 minutes.

077-3.2.11.11.2 Before each use of the training canister, an instructor shall inspect the color of the chemical through the view window. The pink color in the view window indicates a safe canister. As CO_2 is absorbed, the color in the view window will change to a blue color. When the canister has been used by 40 trainees or if the color in the view window is completely blue (whichever occurs first), discard the canister.

077-3.2.11.11.3 All trainees shall be under an instructor's supervision at all times. The instructor shall ensure that the breathing bags are inflated and continually supplying oxygen. If a low oxygen air mixture exists and is inhaled, near immediate collapse of the trainee will occur. Immediate aid shall be rendered by the instructor.

077-3.2.11.11.4 Keep training canisters free of oil, water and oil mixtures, gasoline, and grease.

077-3.2.11.11.5 The training canister firing mechanism and candle assembly get hot after firing the candle. Exercise care when removing training canister firing mechanism and candle assembly for recharging the canister. (See paragraph 077-3.2.11.8.1.)

077-3.2.11.11.6 The chlorate candle used in the training canisters is subject to moisture deterioration. Therefore, do not open training kits until immediately prior to use. Keep kits closed whenever practicable. Do not remove candles from their protective wrappings until the canister is to be recharged.

NOTE

Only candles contained in individual cans with tear-off tops are allowed for use in training canisters. Discard older candles which are wrapped in plastic.

077-3.2.11.11.7 Do not stow training canisters inside the OBA. Do not stow training canister kits in damage control lockers. Do not attempt to cock the firing mechanism while the mechanism is mounted on the training canister. Do not remove the tear-off cap until canister is to be inserted into the OBA. Do not stow the canister without the tear-off cap and plastic storage plug in place. Never stow the canister with the oxygen candle installed.

077-3.2.11.12 Disposal. After the training canister has been used by 40 trainees or if the view window is a solid blue color, dispose of the canister, as outlined in paragraph 077-3.2.8. Once a chlorate oxygen candle has been burned, it contains harmless sodium chloride (table salt) and partially oxidized iron and can be disposed in the regular trash once it has cooled.

077-3.2.12 OXYGEN BREATHING APPARATUS MAINTENANCE. Conduct routine maintenance in accordance with PMS requirements. In addition, clean the OBA and disinfect the facepiece after each use in accordance with PMS requirements.

077-3.2.12.1 For information on OBA corrective maintenance, see the Type A-4 OBA technical manual (NAVSEA SS600-AA-MMA-010/A-4). For information on OBA repairs beyond local capabilities, consult the Master Repairable Items List.

077-3.3 EMERGENCY ESCAPE BREATHING DEVICE (EEBD)

077-3.3.1 GENERAL. The Emergency Escape Breathing Device (EEBD) is part of the allowance for all surface ships. The EEBD is a self contained, hooded emergency breathing device used for escape from compartments contaminated by smoke, fluorocarbon refrigerants, or other atmospheric toxic gases. The EEBD is illustrated, as worn, in Figure 077-3-7. Additional details on the EEBD are contained in the technical manual (NAVSEA SS600-AF-MMO-010).

NOTE

EEBD's are not provided for submarine personnel because sufficient quantities of air-line masks are available for all personnel and, in an emergency, it is quicker to move from compartment to compartment without taking the time to don an EEBD.

077-3.3.2 DESCRIPTION. The EEBD consists of a hood and life support pack. The hood is made of a flame-resistant material. The hood also has a flame-resistant, clear window for viewing.

077-3.3.2.1 The life support pack consists of an oxygen generator and a scrubber element for removing CO_2 and water vapor. The system maintains a positive pressure inside the hood to prevent smoke and toxic gases from entering. The EEBD will operate for 15 minutes after it is activated.

077-3.3.3 DONNING AND PLACING INTO OPERATION. The donning of the EEBD is quick and simple. This makes it suitable for situations where there is little time to seek safety from contaminated atmospheres. To don the EEBD, use the following procedure:

1. Remove the EEBD from its orange, plastic stowage case and grasp the vacuum sealed bag in one hand. Pull tear strip off to fully open bag.

NOTE

The EEBD cannot be turned off once it has been started.

2. Remove the EEBD from the bag. To start the EEBD, put a finger in the actuating ring with the red tape marked PULL TO ACTUATE. Pull hard until the actuation pin separates from the unit. A hissing sound will be heard indicating that the EEBD has been activated.
3. Using both thumbs, spread the neck seal apart.
4. Lean forward and put the EEBD up to your face and place chin in the opening of the neck seal. Pull the hood up and over your head.

5. Stand straight up and pull hood down until the head straps (see Figure 077-3-7) fit snugly around your head. Be sure the neck seal is in contact with your neck, and there is no clothing or hair between the neck and the neck seal.

NOTE

Personnel with glasses may find it easier to don the EEBD while standing straight up. Place chin in the hole and stretch the hood up and over the head.

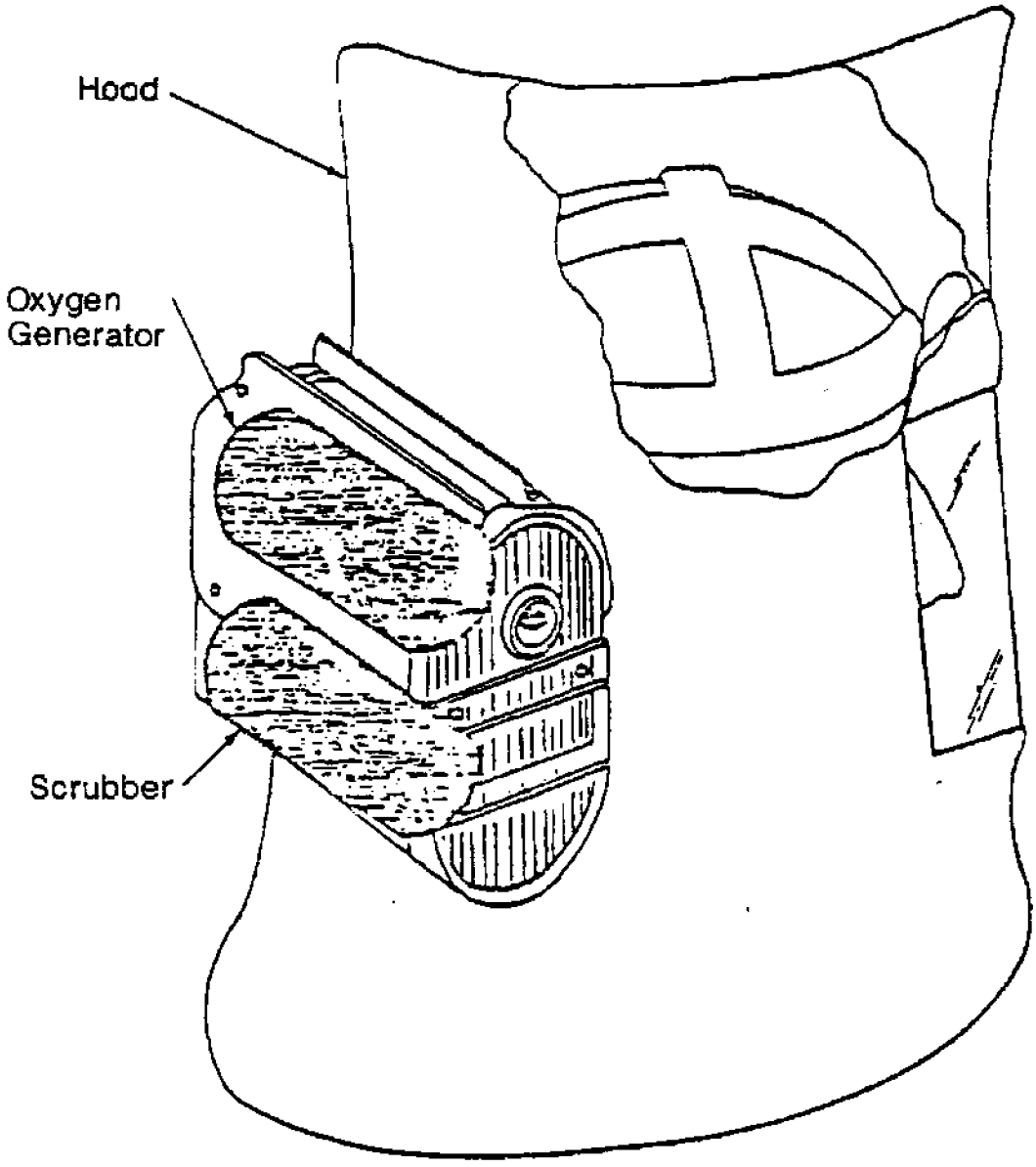


Figure 077-3-7. Emergency Escape Breathing Device Fully Donned

077-3.3.4 EMERGENCY ESCAPE BREATHING DEVICE USE. Immediately don an EEBD when the atmosphere becomes life threatening or when ordered to evacuate the space by the watch supervisor. Don the EEBD prior to exiting a space via a vertical ladder. This is necessary due to the possibility of encountering smoke while

climbing such ladders and the inherent awkwardness associated with this type of egress. Additional guidance for propulsion spaces can be found in **NSTM Chapter 555, Volume 1, Surface Ship Firefighting** , or **Volume 2, Submarine Firefighting** , the main space fire doctrine. If a situation warrants exiting a space but an EEBD is not yet required, carry the EEBD and don it at the first encounter with smoke or other toxic atmospheres.

WARNING

If the hissing sound stops before reaching a safe atmosphere, remove the EEBD in an area away from flames. The wearer will suffocate if the EEBD is worn after the hissing stops. If an unused EEBD is available, put it into operation and don it immediately.

077-3.3.4.1 When response or equipment repair teams enter an area or space where there is the possibility of a life threatening situation arising, they shall bring sufficient EEBD's for all team members. The quantities of EEBD's are in addition to the EEBD's stowed in the area or space for assigned personnel. Keep these EEBD's nearby and readily available for use by team members. When the work has been completed, return the EEBD's to their normal stowage location.

077-3.3.4.2 After reaching an uncontaminated atmosphere away from any flame, remove the EEBD by grasping the back edge of the hood and pull it up and over the head.

077-3.3.4.3 The EEBD support pack makes a continuous hissing noise, ensuring the wearer that the EEBD support pack is generating oxygen. The hissing sound is loud enough to hear over background noise. It is important to speak loudly to anyone wearing the EEBD to make yourself heard over the hissing sound.

077-3.3.4.4 Make EEBD training realistic. Personnel shall memorize EEBD stowage locations and be drilled in quick retrieval and donning of the EEBD. It is important to stress the nature of situations anticipated when an EEBD is needed. Factors such as darkness and the inherent confusion accompanying casualties and fires make it mandatory that use of the EEBD becomes an automatic reflex. Egress training is essential and should be practiced blindfolded. Normal escape routes may not be accessible. Examine every possible escape route during training for emergency situations.

077-3.3.5 PRECAUTIONS. The EEBD is a useful piece of equipment in emergencies. However, there are hazards associated with its use. Observe the following precautions:

1. The EEBD provides only 15 minutes of oxygen for the wearer. After the time has expired, noted by the stop of the hissing noise, the EEBD must be removed or the wearer will suffocate.
2. Use the EEBD only for escape from, and while awaiting rescue in, contaminated atmospheres. Never use an EEBD for firefighting, entering voids, or other uses that require a respirator.
3. The hood is flame-resistant. However, the hood can only withstand a few seconds of direct exposure to flames, so avoid burning areas.

077-3.3.6 SHELF LIFE. The EEBD is packaged in a vacuum-sealed plastic bag and then placed in an orange, plastic stowage case. There is a view port in the stowage case for observing a humidity indicator and the date of

manufacture. The shelf life of the EEBD is 16 years. If the date of manufacture has passed 16 years, replace the EEBD with a fresh device. If the humidity indicator has changed color from blue to clear or pink, replace the EEBD. See paragraph 077-3.3.8 for disposal of unusable EEBD's.

077-3.3.7 TRAINING EMERGENCY ESCAPE BREATHING DEVICE. The training EEBD is a non-functional copy of the operational EEBD. These units are labeled as training units and the newer ones are contained in blue rather than orange plastic cases. Stow and lock up the training EEBD's away from the operational units. This is to avoid mistakenly using a training unit during an emergency when darkness or smoke prevents seeing the label or color difference.

077-3.3.7.1 The training units allow personnel to become familiar and proficient in the use of the EEBD without expending an actual EEBD unit. Conduct the training in accordance with Type Commander instructions.

WARNING

The operational EEBD has no replacement parts. The operational EEBD is a one-use, throw-away device. Never have parts replaced after it has been used.

077-3.3.7.2 The EEBD training units have several replacement parts, so the trainer may be used over and over. These parts include the following:

a. Neck seal

b. Lanyard

c. Stowage Bag

077-3.3.7.3 The replacement training unit stowage bags are the commercial resealable type and come in boxes of 500. For more realistic training, notch the bag on each end below the sealing mechanism and attach a 9- x 1-inch strip of adhesive-backed non-skid deck covering (folded in half and pressed on each side of the tear strip) above the notches. There is no substitute for realistic training. Take the time to conduct emergency egress using training EEBD's.

077-3.3.8 DISPOSAL. Expended EEBD's and EEBD's that are unusable because the humidity indicator has changed color from blue to clear or pink, or because the date of manufacture has passed 16 years, must be disposed of as hazardous waste. It is not necessary to activate unusable EEBD's prior to disposal. Allow expended EEBD's to cool for an hour after the hissing has stopped before packaging them for disposal. Stow in a dry environment until disposal is possible. Prepare EEBD's for shore site disposal in accordance with PMS procedures.

WARNING

Chemicals contained in the EEBD will produce a strongly irritating solution when mixed with water. Do not immerse the EEBD in water or stow in a location where flooding is likely to occur.

077-3.3.9 EMERGENCY ESCAPE BREATHING DEVICE MAINTENANCE. Perform maintenance on the EEBD in accordance with PMS requirements.

077-3.4 SUPPLEMENTARY EMERGENCY EGRESS DEVICE (SEED)

077-3.4.1 GENERAL. The Supplementary Emergency Egress Device (SEED) provides an emergency air supply for personnel standing watch or working in all main propulsion and auxiliary machinery spaces on surface ships. This device is not a replacement for the Emergency Escape Breathing Device (EEBD). The SEED, which is worn on the belt of the watchstander and can be donned rapidly, augments the EEBD's fifteen (15) minute supply of oxygen by providing an immediate short duration air supply. The SEED is used in conjunction with escape procedures contained in **NSTM, Chapter 555, Volume 1** .

077-3.4.2 DESCRIPTION. The SEED, which is stowed in a holster and worn on the belt, allows for rapid donning. The SEED weighs 1.3 pounds, is 8.75 inches long by 2.25 inches in diameter, and holds 1.7 standard cubic feet of air at 3000 pounds per square inch (psi). It provides one and a half to three minutes of air depending on the user's respiration rate and volume. A pressure indicator on the side of the regulator has a green area that highlights the operating pressure range, 2600 psi to 3000 psi. If the pressure of the device drops below the green highlighted area (below 2600 psi) at 70oF or higher, the SEED must be removed from service and refilled. The device, after being filled to 3000 psig, is designed to remain above its minimum operating pressure for at least one year. The SEED has a single-stage regulator which is always pressurized and ready for use. The mouthpiece is protected by a removable cover which is attached to the SEED holster with a lanyard. The lanyard pulls the mouthpiece cover from the mouthpiece when the SEED is removed from the holster. Figure 077-3-8 illustrates the SEED without the mouthpiece cover in place. The SEED's were delivered with tamper seals; however, the requirement for a tamper seal has been eliminated.

077-3.4.3 INSPECTION. Inspect and clean SEED's in accordance with Planned Maintenance System (PMS) requirements. In addition, each oncoming watchstander is required to inspect the SEED as follows:

1. Inspect regulator and cylinder for external damage, dents, cracks, and corrosion. Replace unit if damaged.
2. Inspect regulator for signs of dirt or salt contamination. If contamination is evident, remove from service until cleaned.
3. Inspect SEED for a full charge. Pressure indicator pointer should be within green zone at or above 2600 psi.

NOTE

SEED pressure indicators are calibrated at 70° +/- 2° Fahrenheit. The actual indicated pressure can fluctuate with temperature (e.g., a device inspected at 100° Fahrenheit will read approximately 200 psi higher than it would read at 70°

Fahrenheit). If the indicator pointer is in lower edge of the green zone and the ambient temperature is above 70° Fahrenheit, remove unit from service.

4. Inspect SEED regulator for missing check valve cap. Replace cap if missing.

5. Inspect device for torn or missing mouthpiece cover. If cover is torn or missing, replace and remove unit from service for cleaning.

6. Inspect holster for torn or missing parts. Replace if necessary.

077-3.4.4 REFILL. SEED should be refilled at an authorized refilling location.

077-3.4.4.1 AIMD facilities aboard CV, CVN, LHA, and LHD class ships may perform SEED refill using personnel qualified in handling compressed, breathing air and if the source of breathing air meets the requirements in Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, OPNAVINST 5100/19C.

077-3.4.4.2 The source of air used in refilling SEED's is required to have an air quality in accordance with NAVOSH. The NAVOSH Program Manual requires a minimum air quality of Grade D, in accordance with the American National Standards Institute (ANSI) standard Z88.2. The NAVOSH Program Manual also requires that breathing air quality be certified quarterly.

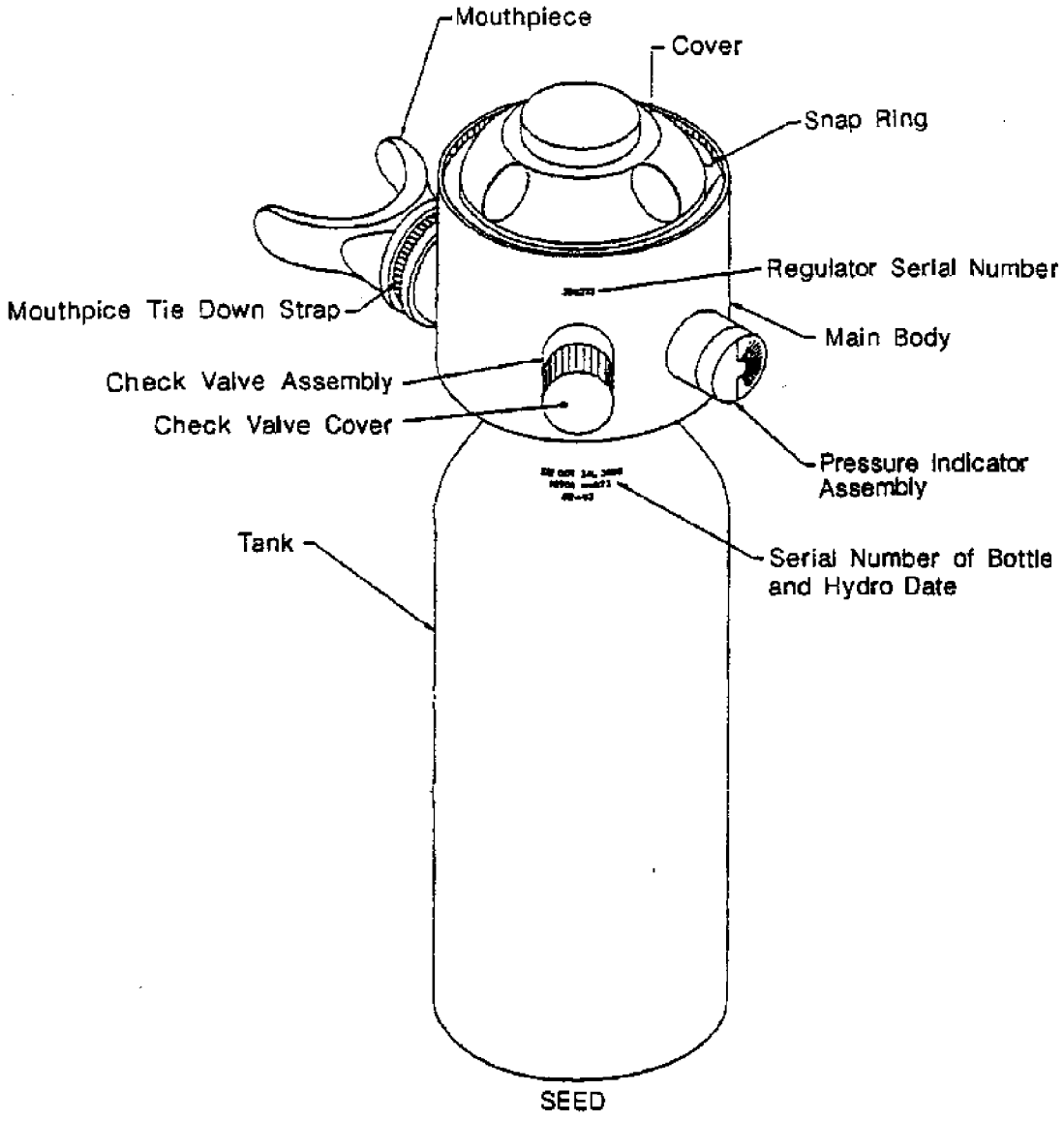


Figure 077-3-8. Supplementary Emergency Egress Device (SEED) Without Mouthpiece Cover

077-3.4.5 REPAIR. SEED repair is currently done at the depot, Submersible Systems Incorporated (SSI), or by manufacturer-certified personnel. SSI is located at 18112 Gothard Street, Huntington Beach, CA 92648, Commercial Phone 800-648-3483. Contracts for repairs should be made through the ship's supply officer or through the local Readiness Support Group (RSG). Uncertified ship's force personnel should not attempt to repair SEEDs, except to replace the following:

a. Mouthpiece

b. Mouthpiece cover

c. Check valve cover

d. Purge cover, plastic insert

e. Holster

077-3.4.6 FEDERAL REGULATIONS PERTAINING TO SEEDS. Cylinders containing compressed air are regulated by the Department of Transportation (DOT). The rules are intended to ensure safe storage of the compressed air. The SEED cylinders are manufactured in accordance with specification DOT-3AL found in the Code of Federal Regulations, Title 49, Section 178.46 or 173.34. Specific Federal requirements are highlighted below for reference by intermediate maintenance activities when SEED's require retest or by packaging and transportation personnel when SEED's need to be transported by commercial rail, truck, air, or waterborne means.

077-3.4.7 SEED RETEST. Federal requirements, 49 CFR 173.34 require that DOT-3AL cylinders receive a visual inspection and hydrostatic test every five years. The visual inspection must be in accordance with Compressed Gas Association (CGA) Pamphlet CGA C-6.1. The hydrostatic test, which tests how much the cylinder expands when pressurized, must be in accordance with CGA C-1.

077-3.4.8 TRANSPORTATION. If pressurized, SEED's must be transported in accordance with DOT requirements. Requirements for external packaging are in 49 CFR 301. Requirements for marking packages are in 49 CFR 172.300. Packages must be certified, in accordance with 49 CFR 172.204, by the packager that the contents are properly classified. Compressed air is transported as a hazardous material. Its shipping name is ″nonflammable gas″ and it is designated with an identification number of UN1002 (see 49 CFR 172.101). These requirements do not apply to SEED's which are not pressurized, therefore the easiest way to transport limited number of SEED's is to release the pressure and remove the regulator so that airline or shipping personnel can verify that they are empty. The SEED must then be reassembled and refilled at the destination by qualified personnel.

077-3.4.9 REQUIRED MARKING FOR NEW SEED CYLINDERS. New SEED cylinders are marked by the manufacturer as follows, in accordance with 49 CFR 178.46:

a. The specification marking ″DOT 3AL″ must appear first on the cylinder followed immediately by the service pressure ″3000.″
b. The serial number and an identifying symbol or letters appear next, see Figure 077-3-8.
c. Do not make other marks on the SEED cylinder since these marks weaken the cylinder.

077-3.4.10 REQUIRED MARKING FOR RETESTED SEED CYLINDERS. SEED's which have been subjected to the hydrostatic retest every five years are marked by the retester as follows, in accordance with 49 CFR 173.34.

077-3.4.10.1 Each cylinder passing retest must be marked with the cylinder retester's identification number set in a square pattern, between the month and year of the retest date.

077-3.4.11 SHIPBOARD MANAGEMENT. The use of the SEED is controlled by the Engineer Officer. The SEED is worn by ALL personnel on watch or working in a main propulsion or an auxiliary machinery space while the machinery is in operation. Personnel obtain the SEED upon entering the space. The space supervisor and the Engineer Officer of the Watch (EOOW) ensure compliance and control access to the SEED.

077-3.4.12 STOWAGE. The SEED is stowed in Main Control, Central Control Station, Engineering Operating Space (EOS), or other appropriate location where the ambient temperature does not exceed 140oF. The SEED is

kept in lockable stowage cabinets originally delivered with the devices. The stowage cabinets are required to be bolted or welded to ship structure at the bottom and top to ensure resistance to shock due to weapon explosion.

077-3.5 EMERGENCY AIR BREATHING STATIONS AND AIR-LINE MASK

077-3.5.1 OVERVIEW. Many surface ships and submarines have Emergency Air Breathing (EAB) stations that supply air to air-line masks for use in atmospheres contaminated by smoke, toxic vapors, fumes, gases, or dust. EAB stations are permanently installed. The stations shall be clearly and visibly labeled and posted operating instructions shall be provided. Airline masks plug into the EAB station for emergency breathing air supply. The mask is illustrated in Figure 077-3-9 and the EAB station is illustrated in Figure 077-3-10.

077-3.5.2 GENERAL. The EAB station and air-line masks may be used when it is necessary to enter voids, tanks, pump rooms, or other compartments under emergency conditions, when testing of the atmosphere or ventilating cannot be accomplished. They are also used in emergency situations when an extended stay in a compartment containing unbreathable air is necessary, such as an airtight compartment or when steering the ship from after steering. They are not used for cleaning or inspection of tanks, painting, or asbestos removal. For these applications, use the authorized breathing devices listed in Table 077-3-1 for non-casualty situations. On surface ships, airline masks are not to be used for firefighting. The SCBA or OBA serves that purpose. On board submarines, the airline mask is to be used by the first man on the scene for firefighting, until relieved by damage control personnel wearing SCBA's or OBA's.

077-3.5.3 TRAINING. All personnel shall be trained in the use of EAB stations and airline masks. Test the supply air system in accordance with Chapter B6 of OPNAVINST 5100.19B to ensure Grade D breathing air quality. If a station cannot meet breathable air specifications, shut it down until it is retested and declared safe.

077-3.5.4 EMERGENCY AIR BREATHING STATIONS. As illustrated in Figure 077-3-10, the supply air line contains an air filter assembly. This assembly is located before the air-line mask quick-disconnect manifold station. The filter consists of a particulate element and refillable charcoal cartridge.

077-3.5.4.1 Identify all EAB manifolds with photoluminescent (glow in the dark) paint or tape per **NSTM Chapter 079, Volume 2, Damage Control - Practical Damage Control** . All EAB station and air-line mask connection fittings are smaller than the standard pneumatic tool connection. This prevents connecting the air-line mask to a service air connection which may contain contaminated air and from hooking tools into the EAB station and depleting the breathable air supply.

077-3.5.4.2 EAB station air supply piping designs vary. On surface ships the air supply may come from either the high pressure or the low pressure air system. A pressure reducing valve is installed for EAB stations connected to high pressure air systems. The reducing valve maintains the supply pressure to the EAB station at the value required for the air-line mask. EAB stations connected to the low pressure air system do not require a reducing valve. High pressure supply systems are also provided with an air storage flask located ahead of the pressure reducing valve. Once the air flask is charged with high pressure air, a valve located in the inlet line to the flask is closed to isolate the EAB station from the high pressure source to prevent contamination. Air is then supplied to the EAB station from the air storage flask through the reducing valve. Low pressure air supply systems do not have a storage flask. However, they do have an isolation valve located before the EAB station filter to shut off the air. This deactivates the station and prevents the filter from becoming full of contaminants while not in use. To activate the EAB station open the isolation valve.

077-3.5.4.3 On submarines, air supply to an EAB air main is supplied from high pressure air system storage flasks through a series of reducing valves. Dedicated EAB station storage flasks are not installed and air is continuously supplied to the EAB stations.

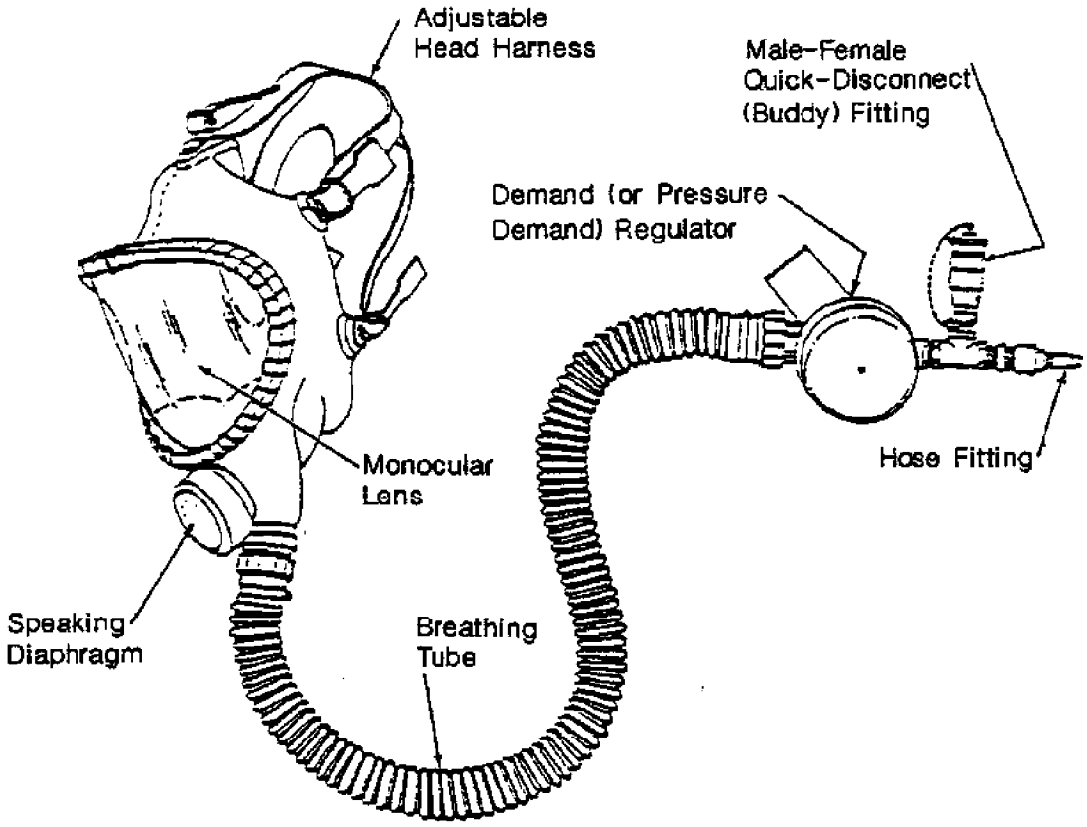


Figure 077-3-9. Air-Line Mask With Buddy Fitting

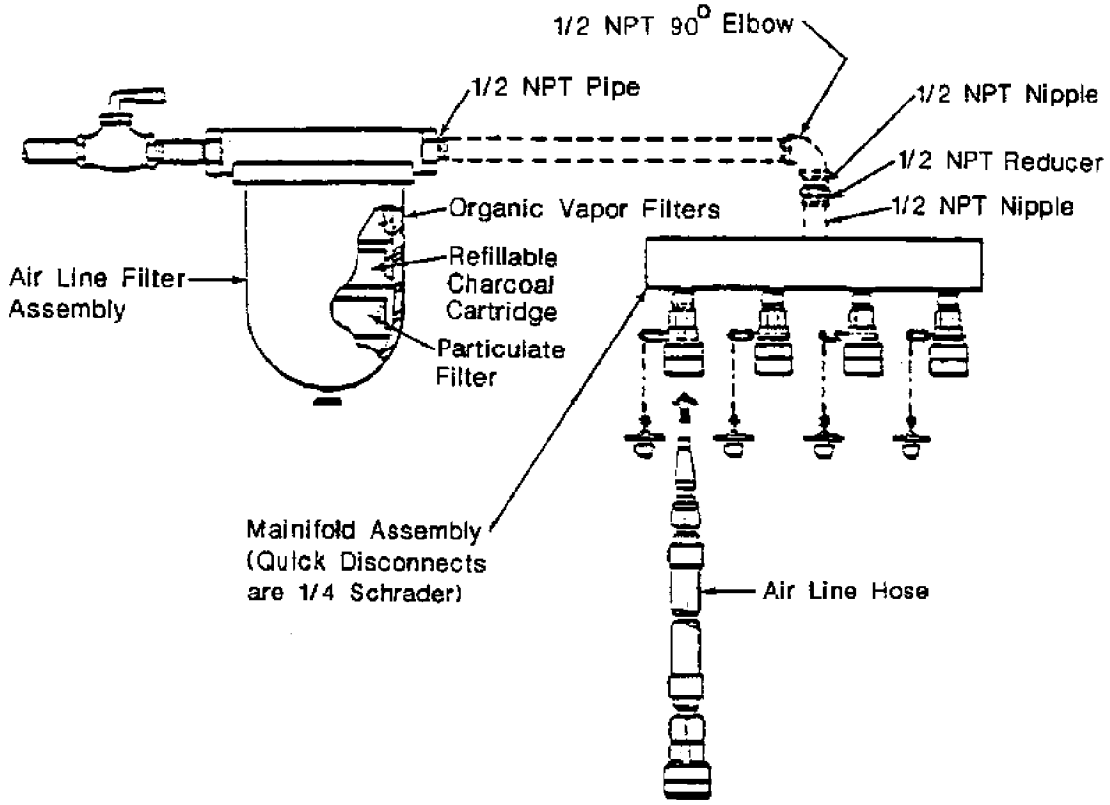


Figure 077-3-10. Air-Line Mask Station

077-3.5.4.4 Detailed information on individual EAB systems is contained in Ship Information Books (SIB's).

077-3.5.5 AIR-LINE MASKS. The air-line mask consists of a single piece lens, adjustable head harness, speaking diaphragm, breathing tube, and belt-mounted regulator, with male and female (buddy) quick-disconnect fittings. It may also come with an annunciator. The mask is supplied with a 25-foot extension hose, with quick-disconnect fittings to allow freedom of movement. Eight-foot hoses are also available for submarines. Air-line masks for surface ships and submarines have different types of air flow regulators.

077-3.5.5.1 Air-Line Mask For Surface Ships. The surface ship air-line mask has a pressure demand regulator. This type of air pressure regulator forces air into the mask at all times. This provides a positive pressure inside the mask, keeping out contaminants should the facepiece not be completely air tight.

077-3.5.5.2 Air-Line Mask For Submarines. Because of air supply limitations inherent in submarines, submarine air-line masks are equipped with flow demand regulators instead of pressure demand regulators. This type of regulator does not maintain a positive pressure inside the mask, which requires that the wearer inhale to draw in fresh air.

077-3.5.5.3 Air-Line Mask Construction. Except for the use of the demand flow regulator, the construction of the submarine air-line mask is the same as the surface ship air-line mask. Since the demand flow regulator requires the wearer of the apparatus to inhale to draw fresh air in, it is critical that the facepiece have a good seal to avoid inhaling contaminated atmosphere.

077-3.5.6 DONNING AND ADJUSTING. To don either the surface ship or submarine air-line mask, use the following procedure:

NOTE

On submarines, the EAB is stowed with an anti-flash hood protecting the facepiece lens (see paragraph 077-3.5.10.4). If the anti-flash hood is not to be worn with the EAB, remove the hood from around the facepiece lens ring and don the EAB as indicated in the following steps. If the anti-flash hood is to be worn with the EAB, don the EAB as indicated in the following steps with the hood still covering the facepiece lens. To don the anti-flash hood after donning the EAB, grasp the far edge of the hood neck opening and pull the hood over the head.

NOTE

If the EAB station to be used is supplied from the low pressure air system (surface ships only), turn on the air supply and allow air to bleed from the station filter drain connection for 30 seconds to remove any contaminants before hooking the air-line mask to the EAB station.

1. Connect the air-line mask breathing tube male fitting into the air hose female fitting.
2. Hook up to the EAB station by pushing the air hose male fitting into the EAB station manifold female fitting.
3. On surface ships, attach the air-line mask regulator to a safety belt using the clip on the regulator. On submarines, attach the air-line mask regulator to the wearer's trouser belt, a quick-release fastening belt, or a safety belt (if needed). A quick-release fastening belt is preferred when the person wearing the EAB needs to don protective clothing and is mandatory if the regulator clip belt modification, described in paragraph 077-3.5.12, has not been accomplished and a safety belt is not worn.
4. Grasp mask with both hands and insert chin into the facepiece chin stop. Pull head harness straps from front of facepiece over head, then adjust head straps as follows:
   a Ensure that harness straps are lying flat against the head.
   b First tighten both lower straps at the same time. Next tighten upper straps. Do not tighten forehead strap at this time.
   c Place both hands on head harness pad (on back of head) and push it down toward neck.
   d Retighten first the lower and then the upper straps.
   e Tighten forehead strap if needed.
   f Test for tightness of facepiece. Squeeze the breathing tube and take a deep breath. The facepiece should collapse inward while the breath is held. This indicates there is a gas tight seal. Hold breath for 5 seconds. If leakage is detected, readjust head harness straps. Test facepiece seal each time facepiece is donned.

NOTE

If the breathing tube is non-collapsible, check the facepiece seal by removing the air hose from the regulator quick-disconnect fitting, placing a thumb over the fitting, and taking a deep breath.

5. Inhale deeply to ensure there is no blockage of the breathing tube, air flow is sufficient, and the regulator is working correctly.

077-3.5.7 OPERATION. The air hose female fitting and EAB station manifold fitting are equipped with an automatic shut off. This enables personnel to evacuate a compartment by using the quick-disconnect fitting. There is no need to secure any valves. To leave a compartment with the air-line mask donned, move as close to the exit as the air hose will permit. Once the hose has been stretched out, take a number of deep breaths, disconnect the air hose from the quick-disconnect fitting, place thumb over end of regulator quick-disconnect fitting, and while holding your breath, leave the compartment immediately.

077-3.5.7.1 A different method is used on submarines for moving from EAB station to EAB station or for leaving a compartment. In this procedure the air hose is disconnected at the manifold instead of disconnecting it from the air-line mask regulator. Move close to the EAB station, take several deep breaths, disconnect the air hose from the manifold quick-disconnect fitting, place thumb over end of air hose fitting and, while holding your breath, leave compartment or move to another EAB station and connect the air hose to it.

077-3.5.7.2 It may be necessary to use a number of air-line masks at a location where only one air supply connection is provided. To permit use of more then one mask, a two or four valve manifold is provided. The air-line mask manifold is illustrated in Figure 077-3-10. One additional mask can also be attached to the buddy fitting of each air-line mask in use (see Figure 077-3-9). The buddy system is employed when two people have to breathe from one manifold supply fitting.

077-3.5.7.3 On board submarines, the air-line mask enables on-scene personnel at a fire or other emergency to don masks and take corrective action, until relieved by damage control personnel wearing SCBA’s or OBA’s. Don the mask whenever the atmosphere is contaminated by smoke, toxic fumes, airborne radioactive contamination, or dust.

077-3.5.7.4 On board submarines, the officer in charge of the control room (Officer of the Deck) and the officer in charge of the maneuvering station (Engineering Officer of the Watch), Diving Officer of the Watch, and Chief of the Watch shall have air-line masks with annunciators available for use. The annunciator on the air-line mask amplifies the wearer’s voice and allows all orders to be heard clearly. This type of air-line mask is donned in the same fashion as the standard air-line mask (paragraph 077-3.5.6).

077-3.5.8 AIR-LINE MASK COMPRESSED AIR CYLINDERS. Use of compressed air cylinders as a substitute for the EAB station is no longer allowed. Any ships that have these cylinders in the shipboard allowance shall return them to the supply system. The only cylinders allowed to be used with this system are the hard mounted flasks in the EAB station supply air lines that are connected to high pressure air systems.

077-3.5.9 GENERAL EAB STATION AND AIR-LINE MASK PRECAUTIONS. If the compartment containing the air intake for the compressor supplying air to the air-line mask should become contaminated with gas or smoke, the air-line mask wearer is in danger. Smoke or gas will be sent through the air hose and will fill the mask, overcoming the wearer. If contamination occurs, secure compressor and start another compressor in a non-contaminated compartment. Once contaminated air has entered the system it is necessary to purge the air line supplying the station.

NOTE

The problem of contaminated air is most likely to occur at stations supplied from the low pressure air system. High pressure air systems receive air from either dedicated EAB station flasks (surface ships) or high pressure air system flasks (submarines) and not directly from a compressor. During EAB station operation the flasks are isolated from the compressor by valves.

077-3.5.9.1 Air-Line Hose. To ensure adequate air supply, the maximum length of air hose allowed is 250 feet. If buddy fittings are used to supply additional air-line masks the total length of air hose out to the last air-line mask shall not exceed 250 feet. Within this limit, use sufficient hose to allow the wearer to carry out all required operations.

077-3.5.9.2 Air-Line Supply. Never attempt to supply EAB stations or air-line masks with high pressure oxygen, such as aviators breathing type or that supplied by the welding shop. There may be traces of oil present in the EAB station or mask as a result of being previously connected to the ship's low pressure air system. The mixing of oxygen and oil may result in an explosion.

077-3.5.9.3 Hose Precautions. The air-line mask wearer shall always be aware of the air hose location. The hose is not fireproof and could be breached if it comes in contact with flames causing loss of air supply to the user and adding air to the fire. The hose is also subject to fouling where there is wreckage or other obstructions. Fouling may cut off the air supply or dislodge the facepiece. Sharp objects may puncture the hose allowing leakage.

077-3.5.9.4 Contaminated Air. EAB stations are designed solely for emergency breathing use. The stations meet only minimum requirements for breathable air and may cause dizziness, numbness, nausea, and inability to think clearly. If air-line mask wearers experience any of these symptoms, they should evacuate to fresh air immediately.

077-3.5.9.5 Additional Safety Precautions for Surface Ships. When using an EAB station and air-line mask on a surface ship observe the following precautions:

1. Do not use an EAB station and air-line mask for any work involving known or potential IDLH atmospheres in non-casualty situations.
2. If possible, defer work until an authorized breathing device listed in Table 077-3-1 can be used for the situation.
3. If the EAB station is supplied from the low pressure air station and there is no other option than to use the EAB station air-line mask, it may be hazardous even after taking the following precautions:
   a Check air intake at compressor for possible contamination.
   b Post safety watches at compressor and work area during air-line mask use. The compressor safety watch shall remain at the compressor and be in constant contact with the watch at the work area.
   c Before any air-line mask is attached to the low pressure air supply, bleed the line for at least 30 seconds to purge any accumulated water or oil.
   d Before using EAB stations, inspect filter elements for possible contamination.
   e Should the wearer experience nausea or dizziness, or should unusual odors become apparent, discontinue use of the air-line mask.

4. Carry an EEBD or keep one within easy reach. The EEBD is used for escape purposes should the air-line mask become unusable.

077-3.5.9.6 Additional Safety Precaution for Submarines. As previously discussed, air-line masks for submarines are equipped with flow demand regulators. Since this type of regulator does not maintain a positive pressure inside the mask, it is critical that the facepiece has a good seal to avoid inhaling contaminated atmosphere.

077-3.5.10 STOWAGE. On surface ships, stow air-line masks and hoses in clearly marked lockers beside all EAB stations. Each locker shall contain hard-mounted instructions for use of the EAB system and enough masks to supply General Quarters manning in the compartment. For each mask, there should be a safety belt, extension hose, and tending line. Stow excess masks and hoses in designated damage control locker locations. Note and replace any missing equipment.

CAUTION

On submarines, before the air-line mask with annunciator is stowed, ensure the volume/on-off switch has been turned down until it clicks off. This prevents the batteries from running down.

077-3.5.10.1 On submarines, air-line masks are stowed in areas which are easily accessible. Locations where the air-line mask may be found aboard submarines vary and include:

a. Under seating in staterooms, the mess deck, and wardroom

b. Lockers near all watch stations

c. In the overheads

Mark stowage locations with photoluminescent paint.

077-3.5.10.2 Personnel shall make themselves familiar with the location of the air-line mask nearest to their watch station, their bunk, and the areas where most of their off duty time is spent.

077-3.5.10.3 Air-line mask equipment (facepiece, regulator and extension hose) is to be stowed connected, in a ready-for-use condition. Stow the mask, regulator, hose, and safety belt (if used) together in the stowage bag.

077-3.5.10.4 On submarines, stow an anti-flash hood and anti-flash gloves with the EAB. In addition, stow a quick-release fastening belt with the EAB if the regulator belt clip modification, described in paragraph 077-3.5.12, has not been accomplished. Use the anti-flash hood to protect the facepiece lens during stowage.

a. If the EAB was worn with an anti-flash hood:
   1 Pull the anti-flash hood forward over the EAB facepiece while leaving the elastic face opening around the top of the lens ring and below the chin stop.
   2 Remove the EAB facepiece by releasing head straps at the buckles before pulling it off. Make sure that the top seam on the anti-flash hood is lined up with the mold seam on the facepiece above the lens ring. Leaving the anti-flash hood in position, pull the head harness in front of the EAB facepiece.

b. If the EAB was worn without an anti-flash hood:

1 Remove the EAB facepiece by releasing head straps at the buckles before pulling it off.

2 With one hand, grasp the top of the anti-flash hood at the seam. Put your other hand through the elastic opening for the face and out the bottom of the anti-flash hood.

3 Grasp the top of the EAB facepiece head harness with the hand that is through the anti-flash hood.

4 Pull the anti-flash hood down over the facepiece so the elastic face opening of the anti-flash hood is around the top of the lens ring and below the chin stop. Line up the seam on the anti-flash hood with the mold seam on the facepiece above the lens ring. If properly done, the EAB breathing tube will be inside the anti-flash hood and the hood will be covering the facepiece lens.

5 Pull the head harness in front of the EAB facepiece.

077-3.5.11 MAINTENANCE OF AIR-LINE MASKS. Inspect and test air-line masks in accordance with PMS requirements. Clean and disinfect the air-line mask facepiece after each use in accordance with PMS requirements. On surface ships, drain the EAB station filter daily for active low pressure stations. An active low pressure station has pressurized air continuously supplied to the filter. Replace the filtering element on stations supplied from either low pressure or high pressure air on surface ships after every use. If a station is not used frequently, change the filtering element when breathing resistance or odor becomes noticeable. High pressure stations shall be periodically checked, and charged if necessary, to ensure sufficient air is available for use. To charge high pressure stations, open the first two valves and fill the flask. Once the flask is full, close both valves. Allow 3 to 5 hours for the air in the flasks to settle (water and oil vapors will settle to the bottom of the flask). After settling occurs, open the valve at the bottom of the flask to bleed off contaminated air until drains are clear.

077-3.5.12 SUBMARINE EAB REGULATOR BELT CLIP MODIFICATION. A modification is authorized to Mine Safety Appliance (MSA) EAB regulator belt clips to facilitate removal in emergencies. Following is the procedure for modifying the clip:

1. Remove clip from regulator and place it in a machinist vise, as shown in Figure 077-3-11, step 1. Place a piece of 1/4-inch thick smooth flat bar between clip and each vise jaw to prevent scoring clip. Insert a piece of 1/8-inch rod (suggest using welding rod) in the clip curl.

CAUTION

When the vise is closed on the clip, the curl may be crushed unless the rod is in place.

2. Close the vise until moderate resistance is felt. Release clip and examine the area where the curl tip contacts the arm. The curl tip should just touch the arm, as shown in Figure 077-3-11, step 2.

NOTE

It will be necessary to over squeeze the clip to permanently deform the clip material.

3. Repeat step 2 as required until the curl tip is just touching the arm along its full length.

4. Turn the clip upside down and insert it into the vise, as shown in Figure 077-3-11, step 2. Retain the flat bars and insert a 5/32-inch rod (suggest using welding rod) in the clip.

CAUTION

When the vise is closed on the clip, the curl may be crushed unless the rod is in place.

5. Close the vise until moderate resistance is felt. Release the clip and examine the area where the curl contacts the back. The curl should just touch the back.

6. Repeat step 5 as required until the curl is just touching the back of the clip along its full length.

7. The final modified shape of the clip is shown in Figure 077-3-11. Put the clip back on the regulator and try placing the regulator on and off the belt several times to ensure it can be quickly removed and there is minor resistance when placing the regulator on and off the belt.

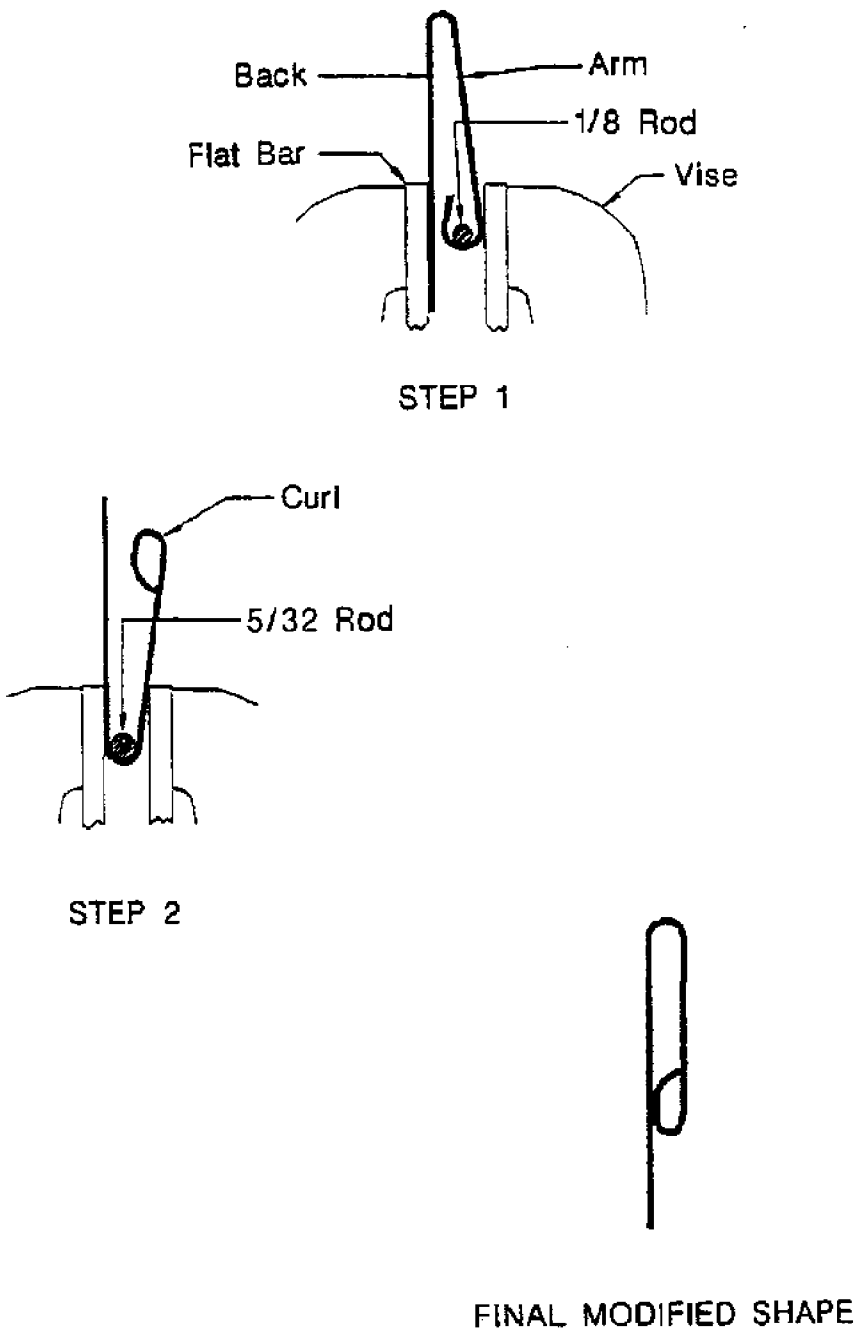


Figure 077-3-11. Air-Line Mask Regulator Clip Modification

077-3.6 COMPRESSED AIR SELF-CONTAINED BREATHING APPARATUS (SCBA)

077-3.6.1 DESCRIPTION. Compressed air self-contained breathing apparatus supply breathable air to the user from pressurized air cylinders carried by the user. Exhaled air is expelled to the atmosphere. Several different models are available. The major parts of a typical compressed air SCBA include an air cylinder support harness, one air cylinder, regulator, alarm, and facepiece. Some models use a body-mounted regulator connected to the facepiece by a breathing tube, and others use a regulator mounted directly onto the facepiece.

077-3.6.1.1 Air Cylinder. Air cylinders may be constructed of metal or a lightweight composite material. Air cylinders are rated in terms of the number of minutes of air they will provide to a user.

077-3.6.1.2 Regulator. The regulator may be a pressure demand type regulator or a demand type regulator. A pressure demand regulator forces air into the facepiece at all times. This provides a positive pressure inside the facepiece, keeping out any harmful atmosphere should the facepiece not be completely air tight. A demand regulator does not maintain a positive pressure inside the facepiece. The user has to inhale to draw in fresh air from the regulator. A dual purpose regulator may also be supplied with the equipment which allows an air line to be used as an alternate source of air.

077-3.6.2 DONNING AND ADJUSTING. Don the compressed air self-contained breathing device as follows:

077-3.6.2.1 Air Cylinder Support Harness. Don additional required protective clothing and equipment before the compressed air SCBA. Assemble all parts, and don the air cylinder support harness in accordance with manufacturer's instructions. Pay particular attention to the following:

WARNING

Several models of compressed air SCBA's are available. Do not mix parts. If the parts are color-coded, be sure the correct parts are matched.

1. Be sure the air cylinders have been fully charged and the air cylinder is compatible with the regulator.
2. Check that all air hose union gaskets or sealing devices are in good condition and all connections are secure.
3. Check that all regulator union gaskets or sealing devices are in good condition.
4. Position the body-mounted regulator on the body to be within easy reach at all times. Twist upper body and raise arms head high to check for easy movement. The face-mounted regulator should be in its holder mounted on the body when in standby mode.

077-3.6.2.2 Breathing Tube and Facepiece. Don the breathing tube, if applicable, and facepiece as follows:

1. If applicable, check the breathing tube and facepiece union connections to be sure gaskets or other sealing devices are in good condition. Connect the breathing tube to the facepiece.

WARNING

Remove eyeglasses before donning the facepiece. Eyeglasses will prevent the mask from sealing properly. If vision is poor without eyeglasses, spectacle kits are available for installation in the facepiece. Soft and gas-permeable contact lenses can be worn.

2. Check that the facepiece lens is clean and adjust the head straps for maximum length. Insert chin into the facepiece chin stop.
3. Pull head harness straps from front of facepiece over head. Ensure straps are lying flat against the head.
4. Tighten lower straps first. Next tighten upper straps. Do not tighten forehead strap at this time.
5. Place both hands on head harness pad (on back of head) and push it down toward neck.
6. Hold the facepiece firmly with both hands while moving the head to gain the most comfortable fit. Position the lens for good vision. Retighten first the lower and then the upper straps. Tighten the forehead strap if needed.
7. Check the fit of the facepiece by inhaling gently while covering the free end of the breathing tube with the hand. The facepiece will collapse inward while the breath is held. This indicates there is a gas tight seal. Hold breath for 5 seconds. If the seal is not satisfactory, adjust the position of the facepiece and retighten the straps. Continue until the seal is satisfactory.

077-3.6.3 OPERATION. When ready to enter the contaminated atmosphere, activate the compressed air self-contained breathing device as follows:

WARNING

Review the manufacturer's instructions carefully with respect to SCBA operation.

1. Connect either the breathing tube to the body-mounted regulator or the face-mounted regulator to the facepiece, as applicable. Be sure that the regulator is providing air.
2. Check for satisfactory mobility by turning the head fully. The breathing tubes should not twist or stretch abnormally. Reposition the regulator if necessary.
3. Connect the air line from the alternate air source (if used). Check operation of the regulator in accordance with the manufacturer's instructions making sure the regulator supplies a continuous source of air.

077-3.6.4 INSPECTION, CLEANING, STOWAGE, AND MAINTENANCE. To ensure adequate performance and proper sanitation, maintain the equipment in accordance with Preventive Maintenance System (PMS) procedures. In the absence of PMS procedures, follow manufacturer's recommended maintenance procedures.

077-3.7 SUPPLIED AIR RESPIRATOR WITH BACKUP SELF-CONTAINED BREATHING APPARATUS (SAR/SCBA)

077-3.7.1 DESCRIPTION. The supplied air respirator with a backup self-contained breathing apparatus (SAR/SCBA) provides breathing air to personnel in atmospheres which are immediately dangerous to life or health (IDLH). The SAR/SCBA contains a full facepiece respirator operated in the pressure demand mode and is NIOSH approved respiratory protective equipment.

077-3.7.1.1 The normal supply of air for the SAR/SCBA is from compressed air cylinders mounted in a portable primary air supply pack and in portable reserve air supply packs. The primary air supply pack contains one compressed air cylinder, a hose manifold, first stage pressure regulator, pressure gages, a three-way valve, bleed valves, relief valve, and a low pressure alarm. Each reserve air supply pack contains two compressed air cylinders. The primary air supply pack and each reserve air supply pack weighs about 70 pounds and can be hand-carried and placed near the space to be entered. One compressed air cylinder can provide about 60 minutes of breathing air for a single user when charged to 4500 psi. Additional cylinders can be connected to the control manifold in the primary air supply pack without interrupting the air supply to the user. This provides an indefinite supply of breathing air.

077-3.7.1.2 The backup supply of air for the SAR/SCBA is from compressed air cylinders contained in a carry pouch worn by the user. The carry pouch also contains an air manifold, first stage pressure regulator, pressure gage, cutoff valve, and a low pressure alarm. The backup compressed air cylinders have a rated air supply of 15 minutes.

077-3.7.1.3 Normal or backup air is supplied to a breathing tube attached to a second stage pressure regulator which then discharges air into a facepiece. The second stage pressure regulator is a pressure demand type which forces air into the facepiece at all times. This provides a positive pressure inside the facepiece, keeping out any harmful atmosphere if the respirator properly seals to the face.

077-3.7.2 USE.

WARNING

Only properly trained and fit-tested personnel shall use a SAR/SCBA. Similarly, only properly trained personnel shall tend the normal air supply (control manifold in primary air supply pack) for the SAR/SCBA.

077-3.7.2.1 Applications and Restrictions.

a. The SAR/SCBA can be used in atmospheres that require respiratory protection, including atmospheres immediately dangerous to life or health (IDLH). IDLH atmospheres are defined in **NSTM Chapter 074** .
b. This breathing device enables personnel to enter confined or enclosed spaces. This can occur when such spaces need to be gas-free tested.
c. This breathing device enables entry into IDLH or potential IDLH spaces for rescue of personnel.
d. This breathing device is not to be used for fire fighting.

077-3.7.2.2 Preparation of the SAR/SCBA for Use.

1. Perform the inspections listed in paragraph 077-3.7.6.2.
2. Locate the portable primary air supply pack and reserve air supply packs in fresh air as close to the entrance of the IDLH space as possible. Position the primary air supply pack in a way that pressure gages can be seen and that air cylinders in the reserve air supply packs can be connected to the control manifold.

WARNING

Make sure the installed and spare air cylinders are charged to 4500 psi.

3. Check that the air cylinder in the primary air supply pack is connected to one of the hoses from the control manifold. If not connected, check the O-ring on the hose fitting before connecting it to the air cylinder. If the O-ring is missing, cut, or scarred, it must be replaced before the fitting is connected to an air cylinder.

WARNING

Before connecting the plug (male) and socket (female) air hose fittings, visually inspect both for presence of foreign material in the areas to be connected. If foreign material is present it must be cleaned out before joining the fittings.

4. Check that the socket (female) fitting on each air hose section has a gasket installed. Assemble the air hoses by inserting the plug into the socket fitting. The fittings are equipped with a locking device in the socket sleeve that requires the notch in the sleeve to be aligned with the ball stop on the socket before the fittings can be coupled. Once coupled, the sleeve should be rotated to misalign the notch and ball stop which enables the locking feature of the joined fittings.
5. Assemble air hose sections to provide the total length necessary for each user to move about freely in the IDLH space. Connect the air hoses into the air manifold in the primary air supply pack.

WARNING

Do not exceed a maximum hose length of 300 feet.

6. The number of spare air cylinders that will be required depends on the number of personnel provided air and the amount of time air is supplied to them. Table 077-3-3 lists the minimum number of spare cylinders, in addition to the one cylinder contained in the primary air supply pack, necessary to support the number of personnel for the period specified.
7. Perform the inspections listed in paragraph 077-3.7.6.1.
8. Check that the air hose connects properly with the hose fitting at the waist belt for the carry pouch.

Once the check is completed, disconnect these fittings to permit ease in donning the carry pouch.

WARNING

Make sure the backup air cylinders in the carry pouch are charged to the FULL indication shown on the pressure gage. Less than a full charge reduces the backup supply of air which may be required in an emergency for escaping from an IDLH atmosphere.

Table 077-3-3. REQUIRED NUMBER OF SPARE AIR CYLINDERS FOR NORMAL AIR SUPPLY ASSUMING AIR CYLINDERS ARE CHARGED TO 4500 PSI

Number of Personnel	Amount of Time Breathing Air Supplied		
	15 minutes	30 minutes	60 minutes
1	0 cylinders	0 cylinders	1 cylinder
2	0 cylinders	1 cylinder	2 cylinders
3	0 cylinders	1 cylinder	3 cylinders
4	1 cylinder	2 cylinders	4 cylinders

077-3.7.2.3 Use of a Safety Line. Safety harnesses and lines shall be used whenever a person equipped with a SAR/SCBA enters an IDLH atmosphere. When safety lines are used, one end is connected with a snap hook to the safety harness on the person entering the IDLH space, and the other end is held by the attendant at the entrance to the space. The line is used primarily to locate an incapacitated person. Additionally, the line can be used as a means of passing signals between the attendant and the person in the space.

1. The safety line shall be 1/2-inch diameter (or larger) nylon line (length determined by size of space). The line has a stout hook at each end, which is closed with a snap catch.
2. To locate incapacitated personnel who wear safety lines, follow the safety line to their location. Do not attempt to pull personnel out of a space using the safety line because this may injure them more.

WARNING

If at all possible, never haul stricken personnel by a line attached to their waist; this can cause internal injury. In an emergency, they may be dragged a short distance along the deck, but not suspended from the waist. If it is necessary to suspend a person from a safety line, a harness should be placed on the person and the safety line connected to a Y-bridle attached to the harness shoulder straps.

077-3.7.3 DONNING AND ADJUSTING THE CARRY POUCH AND FACEPIECE AND SUPPLYING BREATHING AIR TO THE FACEPIECE.

077-3.7.3.1 Don protective clothing and equipment (such as harnesses) **before** donning the carry pouch. Clothing or equipment worn over the carry pouch could possibly crimp air hoses, cover the pressure gage, or cause undue discomfort.

077-3.7.3.2 The following steps provide the procedure for donning the air cylinder carry pouch.

1. Place the carry pouch at your left hip with the pressure gage facing away from the body.
2. While supporting the pouch with your left hand, raise the shoulder strap over your head and place it on your right shoulder.
3. Let the shoulder strap support the carry pouch. Wrap the belt around the waist and buckle it.
4. Adjust the shoulder strap and waist belt for a comfortable fit. The weight of the carry pouch should be supported by the shoulder strap while the waist belt holds the pouch close to the body.

077-3.7.3.3 Use the following procedure to prepare and don the SAR/SCBA.

1. Check the fitting connections on the breathing tube and hose on the carry pouch shoulder strap to be sure the gasket and fitting connections are in good condition. Connect the breathing tube to the hose on the shoulder strap.
2. Check the fitting connections on the air hose from the primary air supply pack to the waist belt of the carry pouch to be sure the gasket and fitting connections are in good condition. Connect the air hose from the primary air supply pack to the air hose fitting on the waist belt of the carry pouch.
3. Ensure that the three bleeder valves on the control manifold in the primary air supply pack are closed and that the three-way valve is aligned to the air hose connected to the air cylinder to be placed in service.

CAUTION

Remove eyeglasses before donning the facepiece. Eyeglasses will prevent the mask from sealing properly. If vision is poor without eyeglasses spectacle kits are available for installation in the facepiece and shall be worn. Soft and gas-permeable contact lenses can be worn.

4. Check that the facepiece lens is clean and adjust the head straps for maximum length. Place the head straps over the top of the facepiece and let them rest against the lens, on the outside of the facepiece. Insert chin against the facepiece chin stop. While holding the facepiece with one hand, use the other hand to move hair away from the forehead while placing the facepiece against the face.

CAUTION

Should hair be caught between the face and the facepiece seal, the seal will not be air tight. This will cause air leakage out of the facepiece which could allow contaminated air into the facepiece and also result in an increased rate of breathing air consumption. Consequently, when donning the facepiece, care should be taken to keep hair away from the facepiece seal.

5. To pull the head harness over the head, start with the straps in the fully extended position. Tighten straps in pairs. Start with center straps, move down to bottom straps, then tighten top straps last.
6. Have the attendant immediately open the supply valve on the air cylinder to be placed in service. If the air cylinder is already in service, have the attendant immediately connect the air hose into the air supply fitting in the manifold. This will provide breathing air to the facepiece. As the supply valve is opened, the attendant

should adjust the pressure regulator on the control manifold to provide a discharge pressure of 60 to 80 psi, shown on the low pressure gage downstream of the regulator. The wearer should take a few breaths to verify that breathing air is supplied to the facepiece. If air is not supplied, remove the facepiece and check for the cause of blockage to air flow. The Don/Doff control allows the user to stop air flow to the mask by pushing down on the control button. The user resumes air flow by donning the mask and taking a quick deep breath. This allows the user to be in a constant standby condition without wasting air. The Don/Doff control can also be used to clear facepiece lens fogging.

7. When the head straps are tightened properly, the large piece of rubber on the straps should be centered in the back of the head.

8. Hold the facepiece firmly with both hands while moving the head to gain the most comfortable fit. Position the lens for good vision. If necessary, retighten the lower straps.

9. Check the fit of the facepiece for a gas tight seal. If the seal is not satisfactory, adjust the position of the facepiece and retighten the straps. Continue until the seal is satisfactory.

CAUTION

When a facepiece leak is detected, the user must correct it immediately by adjusting the position of the mask and tightening the facepiece straps. Any time a facepiece leak is detected that cannot be corrected, the wearer must exit the IDLH atmosphere immediately.

10. To receive breathing air from the carry pouch backup air supply, open the backup air supply valve. (The backup air supply shall only be used for emergencies and escapes from IDLH atmosphere.)

077-3.7.4 PRECAUTIONS.

077-3.7.4.1 Carry Pouch Backup Air Supply. Take care to protect the air cylinders, air hoses, regulator, and breathing tube from damage. If damage occurs while in an IDLH atmosphere, return to a safe atmosphere immediately.

077-3.7.4.1.1 When the carry pouch backup air supply is activated, leave the IDLH atmosphere immediately.

077-3.7.4.1.2 If there is difficulty breathing in an IDLH atmosphere, open the backup air supply valve and immediately exit the space. If the air hose from the primary air supply pack impedes escape, then disconnect the hose from the carry pouch waist belt.

077-3.7.4.2 Primary Air Supply Pack. If the attendant experiences difficulty feeding breathing air hoses from the primary air supply pack through the access to the IDLH space or the hoses become kinked or the air supply is interrupted, the attendant should immediately signal personnel to exit from the IDLH atmosphere.

077-3.7.4.2.1 The primary air supply pack should be attached to the deck or an adjacent bulkhead to prevent movement, especially if the ship is underway.

077-3.7.5 OPERATION.

077-3.7.5.1 Carry Pouch Backup Air Supply and Facepiece. When ready to enter an IDLH atmosphere perform the following checks:

1. Be sure the regulator is providing sufficient breathing air to the facepiece and the pressure demand exhalation valve is operating properly. The facepiece should be slightly pressurized and the wearer should be able to breathe without laboring.
2. Check that the air-line attachment to the breathing tube does not restrict face mask mobility. This can be checked by the wearer turning his head fully to each side, then up and down to check for freedom of movement.
3. The hose connected to the breathing tube and the supply hose from the remote primary air supply pack should not be twisted or stretched abnormally.
4. Check that the carry pouch backup air supply cylinder pressure gage is visible and can be viewed by the wearer. Also, check that the pressure gage reads FULL.

077-3.7.5.2 Primary Air Supply Pack Operation. When the primary air supply pack is providing air, the following procedures apply:

1. The attendant shall frequently check and, if necessary, regulate the discharge pressure in a range of 60 to 80 psi. This is accomplished by manually adjusting the pressure regulator on the control manifold while monitoring the regulator discharge pressure gage. Discharge pressures above 125 psi may cause the safety valve to lift.
2. The attendant shall ensure that a fully charged spare air cylinder is always connected to the control manifold in the primary air supply pack using the following procedure:
   a Check that the bleed valve in the air hose to be connected to the spare air cylinder is closed.
   b Visually check that there is no particulate in the cylinder or hose fittings. Fasten and make the hose fitting hand tight onto the cylinder fitting.
3. The attendant shall monitor pressure in the cylinder being discharged. This pressure is indicated on the high pressure gage upstream of the regulator. The attendant shall align the spare cylinder to provide air when the air pressure reaches 500 psi or the low pressure alarm sounds, whichever occurs first. Table 077-3-4 lists the approximate amount of time that a single cylinder can provide air for the number of personnel listed.
4. The procedure to align the spare cylinder to provide air is as follows:
   a Check that the bleeder valve in the air hose connected to the air cylinder to be placed in service is closed.
   b Open the supply valve on the air cylinder which is being brought into service.
   c Align the three-way valve to the air cylinder being placed in service and secure the supply valve on the air cylinder which is being secured. The valve is closed by first pushing in on the valve handwheel and then twisting the handwheel closed.
   d If necessary, adjust the pressure regulator to maintain 60 to 80 psi discharge pressure.
5. Replace air cylinders as they become expended, until all personnel have exited the IDLH space. Replace cylinders by applying steps 2 through 4 above.

Table 077-3-4. APPROXIMATE DURATION FOR ONE CYLINDER SUPPLYING AIR ASSUMING CYLINDER IS CHARGED TO 4500 PSI

Number of Personnel	Amount of Time One Cylinder Can Supply Air
1	60 minutes
2	30 minutes
3	20 minutes
4	15 minutes

077-3.7.6 INSPECTION, CLEANING, STOWAGE, AND MAINTENANCE.

077-3.7.6.1 Facepiece and Carry Pouch Backup Air Supply Inspections. Inspect the facepiece and carry pouch backup air supply before and after each use for the following:

a. Head straps - breaks, loss of elasticity, broken or malfunctioning buckles and attachments, or excessively worn areas on the head straps which might loosen when buckled.

b. Facepiece - dirt, cracks, tears, holes, stiffness, or distortion from stowage; cracked, badly scratched, marred, or incorrectly mounted facepiece lens, missing or broken facepiece regulator connecting ring, intact and functional pressure demand exhalation valve, and cracked speaking diaphragm housing.

c. Air hoses - missing, torn, or cut gaskets in hose fittings; tears or cuts in the hose sections. Ensure that proper hoses are used with the SAR/SCBA. Hoses may not be interchanged or locally manufactured.

d. Breathing tube - cracks, tears, cuts, or holes in the breathing tube; missing, torn, or cut gaskets or sealing devices in the facepiece connection and the upstream of the regulator.

e. Air cylinders - unraveled strands; nicks, cuts, abrasions, and current hydrostatic test date.

077-3.7.6.2 Primary Air Supply Pack Inspections. Inspect the primary air supply pack before and after each use for the following:

a. Hold down clamp - loose or broken air bottle hold down clamp.

b. Air hoses - missing, torn, or cut O-rings on hose fittings; tears or cuts in hose sections.

c. Fittings - loose or broken fittings.

d. Gages - cracked, broken, or missing gage cover glass; broken or defective gage; gage out of calibration or with an expired calibration sticker.

e. Air cylinder - unraveled strands, nicks, cuts, abrasions, defective supply valve and pressure gage, and current hydrostatic test data.

f. Valves - defective bleed valves, three-way valves or pressure regulator valve.

g. Proper operation using the following procedure:
   1 Check that one of the air hoses is connected to a full air cylinder and that the three-way valve is aligned to the hose connected to the air cylinder.
   2 Check that all bleed valves are closed and that the regulator is closed.
   3 Open supply valve on air cylinder and audibly check for leaks in hose, piping and fittings.
   4 Check that the high pressure gage reads the same pressure as pressure gage installed on air bottle.

5 Slowly open regulator and adjust low pressure to 60 to 80 psi. Check for audible leaks in piping and fittings downstream of the regulator.

6 Continue opening regulator and check that relief valve opens when downstream pressure reaches 140 psi.

7 Close regulator and open low pressure bleed valve. Check that relief valve closes.

8 Close supply valve on air cylinder.

9 Open bleed valve in air hose connected to air cylinder and check that low pressure alarm sounds when upstream pressure reaches 500 psi.

077-3.7.6.3 Reserve Air Supply Pack Inspections. Inspect the reserve air supply packs before and after each use for the following:

a. Hold down clamp - loose or broken air cylinder hold down clamps.

b. Air cylinders - unraveled strands; nicks, cuts, or abrasions. Defective supply valves and pressure gages, and current hydrostatic test date.

077-3.7.6.4 Air Hose Inspections and Stowage. Air hoses should be given the following inspections before and after each use and stowed in the manner described:

a. Hoses - tears, cuts, or abrasions more severe than scuff marks.

b. Fittings - torn or deteriorated gaskets in socket (female) fittings; dirt, dust, or other foreign material fouling the sleeve or fitting mating surfaces.

c. Once inspections are complete each hose section should be coiled and have socket and plug fittings coupled to preclude foreign material entering the hose during stowage.

077-3.7.6.5 Facepiece Cleaning and Stowage. Clean and sanitize parts after each use as follows:

1. Remove the second stage regulator from the facepiece and store in a clean dry area.

2. Using a soft brush, clean cloth, or sponge, thoroughly hand wash the facepiece and nose cup (if present) in a warm water and mild soap solution. Immerse the facepiece in the soap solution, rinse completely and run water through the pressure demand exhalation valve. Turn facepiece upside down to drain water.

CAUTION

Do not let the cleaning solution temperature exceed 110 °F (43 °C).

3. Sanitize the facepiece using one of the following solutions. Immerse the facepiece in the disinfectant solution for 2 minutes.
   a A 50 parts-per-million (PPM) chlorine and water solution (add 2 milliliters of bleach to 1 liter of water).
   b Aqueous iodine solution, 50 ppm (Povidone/Iodine solution 7.5 percent).
   c A disinfectant solution recommended by the manufacturer or other disinfecting agents used for similar applications.

4. After rinsing, turn facepiece upside-down and shake to remove excess water. Air dry in a clean, uncontaminated area in a way that prevents distortion of the facepiece.

CAUTION

Do not exceed a drying temperature of 110 °F (43 °C).

5. When completely dry, reassemble all parts and place facepiece in a clean plastic bag or other container. Stow in cases provided with the SAR/SCBA.

077-3.7.6.6 Primary Air Supply Pack Stowage. Stow the primary air supply pack in accordance with the following requirements:

1. Ensure that the air cylinder hose fitting is fastened hand tight to the air cylinder. Do not stow the primary air supply pack without the air cylinder installed to preclude entry of foreign material into the hose and to protect the O-ring on the fitting.
2. Check the air pressure on the cylinder gage to ensure that the cylinder is charged to the required pressure.
3. Check that the cylinder is securely fastened by the hold-down clamp.
4. Ensure the pack is either laid flat with the cylinder parallel with the deck or set on end with the cylinder in an upright position. Secure the pack to the deck or bulkhead to prevent movement while the ship is at sea.

077-3.7.6.7 Reserve Air Supply Pack Stowage. Stow the reserve air supply packs in accordance with the following requirements:

1. Check the air pressure on the cylinder gages to ensure the cylinders are charged to the required pressure.
2. Check that the cylinders are securely fastened by the hold-down clamps.
3. Ensure each pack is either laid flat with the cylinders parallel with the deck or set on end with the cylinders in the upright position. Secure the packs to the deck or bulkhead to prevent movement while the ship is at sea.

077-3.7.6.8 Carry Pouch Backup Air Supply Maintenance. Recharge the air cylinders in accordance with the following procedure:

1. Remove the cylinders from the carry pouch.
2. Disconnect first stage regulator CGA-346 nut.
3. Connect the filler hose to cylinder valve connection using a CGA-346 nut.
4. Fill cylinders to a pressure of 3000 psi. Wait for the cylinders to cool back to ambient temperature and pressurize (top off) to a pressure of 3000 psi.

NOTE

It is normal for the audible low pressure alarm to sound during the cylinder refilling process.

5. Disconnect the filler hose, re-attach the first stage regulator and place the cylinders back in the carry pouch.
6. Test the compressed breathing air supply system in accordance with Chapter B6 of OPNAVINST 5100.19B to ensure Grade D breathing air quality.

077-3.7.6.9 Primary and Reserve Air Supply Pack Maintenance. Recharge the air cylinders in accordance with the following steps. Do not remove the air cylinders from the packs.

1. Connect the filler hose to the cylinder supply valve connection.
2. Fill the cylinder to a pressure of 4500 psi. Wait for the cylinder to cool back to ambient temperature and pressurize (top off) to a pressure of 4500 psi.
3. Disconnect the filler hose and reconnect the discharge hose fitting to the air cylinder in the primary air supply pack.
4. Test the compressed breathing air supply system in accordance with Chapter B6 of OPNAVINST 5100.19B to ensure Grade D breathing air quality.

077-3.8 SWITCHING BREATHING PROTECTION IN A CBR THREAT ENVIRONMENT

077-3.8.1 GENERAL. When conducting damage control functions in a suspected or confirmed chemical or biological warfare environment, it may be necessary to switch breathing protection while in an area that may be contaminated with toxic agents. For example, escapees from a burning machinery space would switch from a CBR protective mask to an EEBD for escaping and back to a CBR protective mask when an area away from the fire and combustion gases is reached.

077-3.8.1.1 Switching types of breathing protection can be accomplished in relative safety following the guidance below when in areas potentially exposed to vapor agents. Breathing protection should not be switched when exposed to liquid or solid agents as the agent may contaminate the inside surfaces of the CBR protective gear. If the standby gear may have become contaminated with liquid or solid agent, it must be decontaminated in accordance with **NSTM Chapter 470, Shipboard BW/CW Defense and Countermeasures** prior to use.

077-3.8.1.2 Experience indicates that it is simpler and safer to switch OBA canisters than to switch between an OBA and a CBR protective mask and back to the OBA in a CBR environment. Therefore, if the allowance of OBA canisters permits, switching OBA canisters is preferred over switching between the OBA and CBR protective mask.

077-3.8.2 TO SWITCH FROM CBR PROTECTIVE MASK TO EEBD AND BACK TO CBR PROTECTIVE MASK.

1. Open the orange case of the EEBD, remove the EEBD from the orange case and from the sealed bag and pull the ring to activate the EEBD.
2. Take a deep breath and hold it, close eyes tightly, remove the CBR protective mask and quickly don the EEBD in accordance with paragraph 077-3.3.4. Carry the CBR protective mask while escaping.
3. When an area that is safe from fire and combustion gases is reached, prepare the CBR protective mask for donning in accordance with **NSTM Chapter 470** , paragraph 470-4.4.1.1. Take a deep breath and hold it, close eyes tightly, remove the EEBD and quickly don the CBR protective mask in accordance with NSTM paragraph 470-4.4.1.1.

077-3.8.3 TO SWITCH FROM CBR PROTECTIVE MASK TO OBA. Buddy aid is necessary to accomplish the following procedures in a safe and timely manner. Practice is important.

1. Start with the OBA on the chest with the head harness over the front of the facepiece and the facepiece over the wearer's shoulder. A fresh canister should be in the OBA with the bail in the standby position.
2. Remove gloves and helmet (if worn), release the Velcro fastener on the neck band of the firefighter's ensemble (if worn) and pull the flash hood down around the neck.
3. Close the OBA bail, hold the OBA facepiece in front with one hand.
4. Light off the OBA canister quick start candle.
5. With free hand, grasp the outlet valve assembly of the CBR protective mask, close eyes tightly, take a deep breath and hold it.
6. Quickly remove the CBR protective mask and don the OBA facepiece. Tighten all straps of the OBA facepiece before taking a breath or opening eyes.
7. Crimp both OBA hoses and exhale forcefully to clear OBA facepiece (eyes still closed). With hoses still crimped, inhale to collapse facepiece and confirm seal; readjust straps and recheck seal as necessary. Open eyes and resume normal breathing. Set OBA timer.
8. Don other clothing and CBR protective equipment.

077-3.8.4 OBA CANISTER REPLACEMENT. Buddy aid is necessary to accomplish the following procedures in a safe and timely manner. Practice is important. Have CBR protective mask available in case the following procedure has to be stopped for any reason.

1. Prepare the replacement canister by removing the cap and candle cover. Buddy should hold the canister in one hand within easy reach of the OBA wearer.
2. OBA wearer take a deep breath and hold. Buddy crimp both OBA hoses.
3. Quickly lower bail, pull release tab to drop used canister, grab new canister and insert, raise bail and pull lanyard to activate.
4. Release OBA hoses, resume normal breathing and set OBA timer.

SECTION 4.

FIREFIGHTING CLOTHING

077-4.1 INTRODUCTION

077-4.1.1 This section covers the following firefighting clothing:

a. Aluminized Firefighter Proximity Suit

b. Firefighter Ensemble

WARNING

While providing protection from external heat, firefighter's clothing reduces the body's ability to dissipate heat. This results in increased heat stress. The

Warning - *precedes*

on-scene leader shall use common sense and good judgment in dealing with heat stress. Avoid having personnel fully dressed out until required. Guidance for reducing heat stress is contained in paragraphs 077-4.2.2 and 077-4.3.4 covering the proximity suit and firefighter ensemble.

077-4.1.2 Each item is described along with its intended purpose, and directions are provided for its use and care. See **NSTM Chapter 555, Volume 1, Surface Ship Firefighting** and **Chapter 079, Volume 2, Damage Control - Practical Damage Control** for detailed information on shipboard firefighting.

077-4.2 ALUMINIZED FIREFIGHTER PROXIMITY SUIT

077-4.2.1 CONSTRUCTION. The aluminized firefighter proximity suit is worn by firefighters engaged primarily in aircraft fires. It provides the wearer with thermal protection while approaching and operating close to large fires. It allows firefighters to effect rescue of aircraft personnel when crash fires occur and to conduct rapid investigations following fire control. The suit shall be NFPA compliant for proximity firefighting.

077-4.2.2 REDUCTION OF HEAT STRESS FOR PROXIMITY SUIT. As discussed in the warning prior to paragraph 077-4.1.2, firefighting clothing causes increased heat stress. The following actions can significantly reduce heat stress while using the proximity suit.

1. Don complete proximity suit just prior to entering fire zone. While waiting to enter, don trousers and boots. Adjust hood for fit but do not don until just before entering the fire zone.
2. Rotate firefighting personnel during prolonged firefighting. Frequency of rotation should be based on breathing apparatus operating time.
3. Remove the proximity suit as soon as possible after exiting fire zone to allow the body to cool. Plenty of fluids should be available for drinking and washdown.
4. Once the firefighter has demonstrated the ability to properly don the proximity suit, requirements to wear the suit for training may be relaxed, especially during hot weather. Possible training scenarios include completely donning the suit every second or third drill, or donning only a portion of the suit such as the trousers and boots.

077-4.2.3 DONNING AND ADJUSTING. When donning the proximity suit, the first piece put on is the trousers. Once the trousers are on and suspenders have been adjusted, pull on the rubber firefighter's boots. Don the aluminized coat and secure all closures. Remove facepiece cover to expose the gold coated surface of the faceshield. Put hood on and test for fit. Adjust size by using adjusting tabs inside the hood on the hard hat. Remove hood and set aside. Don the breathing apparatus. Do not secure the facepiece. See **NSTM Chapter 077, Personnel Protection Equipment** , Section 3 for directions on donning, adjusting, and using the breathing apparatus. Put on breathing apparatus facepiece, tighten straps, and check for facepiece seal. Next, don gloves and ensure tops of gloves are under the coat sleeves. Lastly, put the hood back on and center the facepiece on your head.

077-4.2.4 OPERATION. Ensure all closures are secured before proceeding into the fire area.

WARNING

Do not expose any aluminized clothing to direct contact with flames. The suit is aluminized to reflect heat. Direct flame may cause injury or death to personnel. When using the aluminized proximity suit, never attempt to walk through flames or come in contact with flames, unless it is unavoidable (surrounded by fire and escape has to be attempted).

CAUTION

The firefighting chemical Purple-K Powder (PKP) will damage aluminized surfaces. Avoid getting the chemical on the suit and rinse immediately if the chemical does get on the suit.

077-4.2.5 STOWAGE. When the firefighter's proximity suit is not in use, hang it where it is readily accessible for immediate use. Keep the suit away from sharp objects to prevent damage to the aluminized surface or puncture or tearing the suit.

077-4.2.6 MAINTENANCE OF PROXIMITY SUITS. Perform proximity suit maintenance after each use in accordance with PMS requirements.

077-4.3 FIREFIGHTER ENSEMBLE

077-4.3.1 GENERAL. The firefighter ensemble is intended to protect the firefighter from short duration flame (flash) exposure, heat, and falling debris.

WARNING

The firefighter ensemble is not a proximity suit. It is not designed to make crash fire rescues. Prolonged contact with flames may cause the clothing to transmit dangerous heat to the body, or may cause the clothing itself to burn, which could result in serious injury or death to the firefighter. The ensemble does not offer complete protection against chemical, biological, or radiological effects. See NSTM Chapter 555 for guidance on the use of the firefighter ensemble in a CBR environment.

077-4.3.1.1 The ensemble consists of the following items:

a. Firefighter's coveralls.

b. Anti-flash hood.

c. Damage control/firefighter's helmet.

d. Firefighter’s gloves (local procurement from authorized list).

e. Firefighter’s boots (part of repair locker AEL).

NOTE

Helmets and boots are not required on submarines

The ensemble is shown in Figure 077-4-1.

NOTE. The breathing apparatus is not shown.

Figure 077-4-1. Firefighter Ensemble

077-4.3.2 CONSTRUCTION. The following paragraphs provide details on the construction of the items contained in the firefighter ensemble.

077-4.3.2.1 Firefighter's Coveralls. The firefighter's coverall design is a one piece, jump suit style. The coveralls consist of an outer shell, a vapor barrier, and an inner fire-retardant thermal liner. The knees, bottoms of the thigh pockets, and bottoms of the legs are reinforced with leather for extra protection. As an additional safety feature, the coverall has reflective markings around the upper arms, lower legs, and torso to highlight the outline of the firefighter, so he can be seen in dense smoke or dim light. The front closure and inside lower legs have brass zippers. There are bellows pockets with Velcro closures on the outside of each thigh and on the front of the left upper arm. The coveralls have a corduroy faced collar with snap fasteners. The sleeves have an integral knit wristlet for wrist protection. The coveralls are available in five different sizes (small through extra-large-tall).

077-4.3.2.2 Firefighter's Anti-flash Hood. The firefighter's anti-flash hood provides protection to the head, neck, and face (except the eyes). The hood can be worn with the breathing apparatus. The hood without a breathing apparatus is illustrated in Figure 077-4-2. It has an elastic face closure and is available in a single size which fits all. The face portion can be pulled up over the nose for additional protection of the face, as illustrated in Figure 077-4-2.

077-4.3.2.3 Damage Control/Firefighter's Helmet. The damage control/firefighter's helmet is designed to protect the head, neck, and face from short duration flame (flash) exposure, heat, and falling objects. The helmet shell material is heat resistant fiberglass. The helmet is provided with a long rear brim, face shield, chin strap, adjustable ″rachet-type″ suspension, reflective markings, and ear flaps that cover the side of the head and neck.

CAUTION

Do not modify the damage control/firefighter's helmet in any manner, including removing the face shield and drilling holes to attach a light. Modification will reduce the protection provided by the helmet.

NOTE

High-intensity helmet lights are provided for the damage control/firefighter's helmet in the damage control locker. These lights may be attached to the helmet.

077-4.3.2.4 Firefighter's Gloves. The firefighter's gloves protect against abrasions, short duration flame (flash) exposure, and heat. The five-finger cut, wristlet gloves are fabricated with leather, aluminized fabric, a waterproof vapor barrier, and fire-retardant liner.

077-4.3.2.5 Firefighter's Boots. The firefighter's rubber boots have steel safety toes and puncture proof steel insoles. Firefighter's boots are available in two models, knee high and hip length. The knee high version is the same boot worn with the aluminized proximity suit. Knee-high boots are worn inside the coveralls and are available in sizes 5 through 15. The hip boots provide protection from deeper levels of hot or boiling water. Hip boots are intended to be worn over the firefighter's coveralls. Hip boots are available in size 10 and size 12. Firefighter's boots are included in the repair locker AEL.

077-4.3.3 REDUCTION OF HEAT STRESS FOR FIREFIGHTER ENSEMBLE. The firefighter ensemble provides significant improvement in protection from the heat of a major fire. As discussed in the warning prior to paragraph 077-4.1.2, this added protection reduces the body's ability to dissipate heat, resulting in increased heat stress. The following actions can significantly reduce heat stress while using the ensemble.

1. Don complete firefighter ensemble just prior to leaving the fire team staging area for fire zone entry. While waiting to enter fire zone, don coveralls only to the waist, tying the coverall arms around the waist. Just prior to actual entry, fully don the firefighter ensemble and breathing apparatus.

2. Rotate firefighting personnel during prolonged firefighting. Frequency of rotation should be based on breathing apparatus operating times.

3. Remove the firefighter ensemble as soon as possible after exiting fire zone to allow the body to cool. Plenty of fluids should be available for drinking and wash down.

4. Once the firefighter has demonstrated the ability to properly don the ensemble, requirements to wear the firefighter ensemble for training may be relaxed, especially in hot weather. Possible training scenarios include completely donning the ensemble every second or third drill, or donning all components except the coverall.

Figure 077-4-2. Anti-Flash Hood

077-4.3.4 DONNING AND ADJUSTING. Don the firefighter ensemble in accordance with the following procedures:

1. Put the anti-flash hood over the head with the elastic face opening over the face. Wearing two anti-flash hoods, if an extra one is available, is an option.

2. Pull out the coveralls. Keep your pants and shirt on, but take off your shoes or boots and remove anything else that will interfere with donning the garment, such as items in pockets. Put on the coveralls and pull them up over shoulders. Insert thumbs through the small loops on the ends of the sleeve wristlets to anchor and keep them under the gloves.

NOTE

Although wearing the firefighter's ensemble coveralls with only shorts and a T-shirt (or similar clothing) underneath will reduce heat stress in mildly hot environments, the lack of clothing underneath the coveralls may increase the chances of local burns in a severely hot or steamy environment.

3. Step into the rubber firefighter's boots. Never put on the boots before you put on the coveralls. Secure the two zippers on the bottom of the coverall legs. Firefighter's boots are superior to normal work boots in protecting from a hot deck and from hot water on the deck. Firefighter's boots should be worn whenever the firefighter's ensemble is required. Wearing a firefighter's boot a size smaller than one's normal shoe size may improve the fit. Wear two pairs of heavy socks, if available, inside the firefighter's boot to improve the fit and increase insulation when working on a hot deck.
4. Stand up the coverall collar and ensure the anti-flash hood is fully inside the collar and down the chest as far as possible. Secure the coverall front body zippers and the two collar snaps.
5. Don the breathing apparatus. Do not secure the facepiece. See **NSTM Chapter 077** , Section 3 for directions on donning, adjusting, and using the breathing apparatus.
6. Pull the anti-flash hood face opening down around your neck. Put on the breathing apparatus facepiece, tighten straps, and check for facepiece seal. Pull the hood back up over the facepiece straps, with the elastic opening over your face.
7. Secure the Velcro closure on the coverall collar. Put the helmet on, secure helmet ear flap Velcro fastener, and fasten the chin strap.

NOTE

Keep breathing apparatus breathing tubes and hoses outside the coverall collar and helmet ear flap

8. The helmet face shield may be worn in the up or down position. If worn in the down position, loosen face shield fasteners on the sides of the helmet brim and rotate the face shield over the facepiece.
9. Remove the gloves from the leg pockets and put them on. Ensure they cover the coverall wristlets. Wrists should be well protected, the wristlet of the glove and the sleeve of the coverall should have a generous overlap. Gloves that are slightly oversized provide an air space between the fingers and the glove which reduces heat and burns. However, wearing over-size gloves reduces dexterity. Wearing anti-flash gloves under leather gloves may improve protection from heat. If they are available, an extra pair of gloves may be brought to the scene to replace gloves that have gotten wet or too hot.

077-4.3.4.1 To take off the gear, reverse the donning order. Remove the gloves, pull up the helmet face shield, loosen the helmet chin strap, open helmet ear flap Velcro fastener, take the helmet off, and open the coverall collar closure. Pull the anti-flash hood down around your neck, and take off the breathing apparatus facepiece. Take off the breathing apparatus, pull off the anti-flash hood, step out of the boots, and take off the coveralls.

077-4.3.5 OPERATION. The scene leader determines the protective clothing requirements for the fire party based on his assessment of conditions at the scene of the fire. In most cases, if the fire is not controlled by the rapid response team or personnel on duty in the fire space, the hose team will require the full firefighter's ensemble. Therefore, unless directed otherwise by the scene leader, the attack team leader, nozzlemen, hosemen, and accessmen should don the full firefighter's ensemble immediately upon arriving at the repair locker and then proceed to the scene of the fire.

077-4.3.5.1 During use of the firefighter ensemble, avoid direct contact with flames. Also avoid sharp and pointed objects which may tear or puncture the suit. Support personnel outside of the fire boundary shall remain in battle dress uniform.

077-4.3.6 STOWAGE. The firefighter ensemble shall be stowed in or near damage control lockers so that they are readily accessible. Before being stowed, ensure the ensemble is clean and dry.

077-4.3.7 MAINTENANCE OF FIREFIGHTER ENSEMBLE. Conduct maintenance in accordance with PMS requirements. The following information on repair of the firefighting ensemble is provided and amplifies PMS requirements:

1. Replace the coveralls if material tears penetrate the vapor barrier, or if the shell is torn more than 2 inches in any one direction. For tears up to 2 inches in length, surface stitch the tear with high-temperature resistant thread. Major repairs, such as replacing a zipper, torn section or damaged components can only be accomplished by authorized service centers (see paragraph 077-4.3.7.2). Replacing such parts are cost-efficient and are recommended instead of procuring a new item.

CAUTION

Do not penetrate the vapor barrier during the repair.

2. Replace the helmet if the shell is cracked, or if the suspension is damaged. Replace the face shield if large scratches on either side of the shield obstruct the view. Tears in the liner, up to 2 inches in length, may be surface stitched using the same high-temperature resistant thread used to repair the coveralls.
3. Replace the anti-flash hood if it has been damaged in any way.
4. Replace the gloves if the inner vapor barrier is torn or punctured. Repairs of the shell are permitted and are mandatory if the leather is cut through or gouged more than 1/2-inch in length, or if the stitching is broken for more than 1/2-inch in length. For repair of damage within these limits, use the same high-temperature resistant thread used to repair the coveralls.

077-4.3.7.1 Soot and dirt buildup on the surface of the garment may eventually contribute to reduced thermal protection, especially at extreme temperatures found in shipboard fires. Also, the threat of heat exhaustion increases when the pores of the outer shell and moisture barrier become clogged with soot and dust. Instructions for routine shipboard cleaning are contained in the PMS requirements. Professional cleaning is warranted for more intensive cleaning or decontamination of garments exposed to hazardous substances. Professional cleaning can only be accomplished by authorized service centers (see paragraph 077-4.3.7.2).

077-4.3.7.2 Two professional cleaning and repair facilities are authorized to restore the coverall to its original protective effectiveness. All repairs performed by these facilities meet Navy, manufacturer's guidelines, and national (NFPA) standards. The facilities offer free garment inspection/evaluation and repair costing to the Navy. The facilities are as follows:

National Safety Clean, Inc.
225 Birch Street
Kennett Square, PA 19348

1 (800) 253-2690
(215) 444-1700
Fax: (215) 444-0135

SeaWestern Fire Apparatus and Equipment
12815 N. E. 124th Street, Suite H
Kirkland, WA 98034
1 (800) 327-5312
(206) 821-5858
Fax: (206) 823-0636

SECTION 5.

ANTI-FLASH AND STEAM CLOTHING

077-5.1 ANTI-FLASH CLOTHING

077-5.1.1 DESCRIPTION. The intended use of anti-flash clothing is to protect personnel from transient, elevated air temperatures resulting from the use of high explosive weapons and from burns caused by fire. The importance of protecting personnel from burns caused by weapons explosions or fire is a lesson learned from combat action. The clothing consists of the following items:

a. Anti-flash hood

b. Anti-flash gloves

All personnel shall wear normal battle dress uniforms with the above items. The hood is the same hood used with the firefighter ensemble, discussed in **NSTM Chapter 077, Personnel Protection Equipment** , Section 4. The gloves are made from fire-retardant cotton and one size fits all. The commanding officer will direct relaxing of battle dress to prevent heat stress. Do not hesitate to don anti-flash clothing whenever a flash threat is imminent.

077-5.1.2 DONNING. The anti-flash hood is quick and easy to don. Simply pull the hood over the head and pull down around the shoulders outside of the shirt. Adjust the hood, so the hole for the face is centered for the best possible vision. The anti-flash hood is normally worn with the eyes and nose exposed, although it may be pulled up over the nose for maximum protection. However, if it is over the nose for long periods, it may obstruct vision or fog glasses. Pull the gloves up over the shirt sleeves until the tips of the fingers are in the fingers of the gloves and the glove gauntlet is fully extended, as shown in Figure 077-5-1. To minimize burns, cover your face and eyes with your arm or hands if you see a flash.

077-5.2 AIR-FED OVEN SUIT (STEAM SUIT)

WARNING

The steam suit is not designed for fire fighting. Using the steam suit in a fire situation, or the firefighter ensemble or aluminized proximity suit in a situ-

Warning - *precedes*

ation requiring a steam suit, could result in personnel injury or death. Ensure equipment is positively identified before use.

077-5.2.1 GENERAL. The steam suit provides limited personnel protection in steam environments at elevated temperatures. It is intended to allow personnel to approach steam leaks to permit isolation or emergency repair. While the steam suit provides limited personnel protection in a severe steam environment, the suit does not render the wearer impervious to burns.

077-5.2.1.1 Experience in Casualties. The Mine Safety Appliances (MSA) steam suit has been effective for isolating steam leaks when used in submarine casualties. In these casualties, the steam leaks resulted in steam plumes. For these type of casualties, the air supply hose can be attached to an Emergency Air Breathing (EAB) manifold sufficiently distant from the steam plume to minimize heating of the air supplied to the steam suit.

077-5.2.1.2 Ambient Steam Environment Tests. Testing of the MSA steam suit in an ambient steam environment demonstrated limited personnel protection.

077-5.2.1.2.1 Testing was performed on an instrumented, stationary mannequin, using a limited number of thermocouples. As expected, the test data shows that the time before the onset of a second degree burn (taken as a 25°F temperature rise measured by a thermocouple on the surface of the mannequin) decreased with increasing steam temperature. At steam chamber temperatures between 171° and 190°F, the shortest time to burn was 6.5 minutes. At steam temperatures ranging from 151° to 170°F and from 130° to 150°F, the shortest times before the onset of second degree burn were 13.0 and 20.5 minutes, respectively. These times to burn may not reflect actual times since a person wearing the suit would be able to adjust the Cool-Flo tube to increase cooling and would be moving, which could cause the air inside the suit to circulate and could help insulate the wearer. However, the test data does show that a burn injury is likely in a higher temperature ambient steam environment and the chance of being burned increases with temperature and duration of exposure.

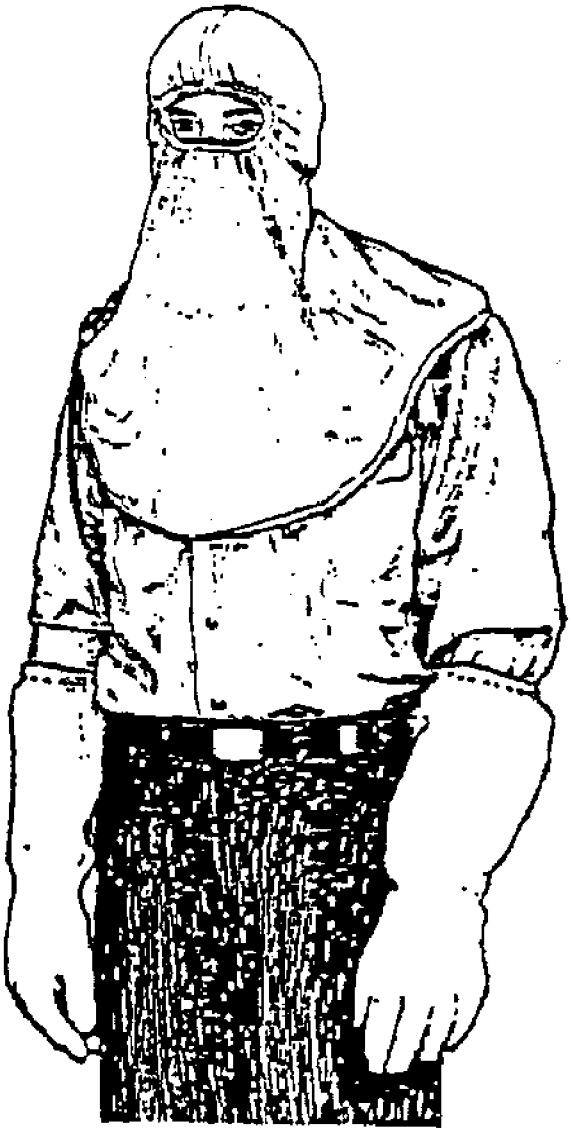


Figure 077-5-1. Anti-Flash Clothing

077-5.2.1.2.2 The temperature of the supplied air is an important factor in the thermal protection provided by the steam suit. Since air is supplied to the steam suit from the EAB lines located within the affected compartment, the air supplied to the suit will be heated by the steam in the compartment as the air moves through the EAB lines and through the air supply hose. Thermal protection of the suit may be reduced because of the effect.

077-5.2.2 DESCRIPTION. The only suit currently authorized is the Mine Safety Appliance (MSA) air-fed oven suit. The steam suit is a one piece coverall with integral gloves and shoe covers. A hood is provided but it is not integral to the suit. The hood is fabricated over an aluminum head protector. The hood has extended front and back bibs with loops to hold the hood in position while being worn. The suit has an aluminized reflective outer coating similar to the firefighter's proximity suit.

077-5.2.2.1 The suit has an air manifold in the back, which distributes air throughout the suit to the hood, both arms, both legs, and the front and back of the torso. Air pressure maintains a balloon effect within the suit, which

provides a protective air space around the body. This provides comfort, freedom to work, and cools the wearer. The air fed into the suit is vented out through the neck area.

077-5.2.2.2 The steam suit has air supplied from an Emergency Air Breathing (EAB) manifold through a 25-foot EAB hose. The hose is attached to a cool-flow tube which attaches to the manifold connection on the back of the suit.

077-5.2.3 DONNING AND ADJUSTING. Don the steam suit as follows:

1. Pull the suit on like general work coveralls. Be careful while inserting shoes to ensure the coveralls' shoe covers do not tear.
2. Slide arms through sleeves and insert hands into the gloves.
3. Secure front closure and cover with the protective flap.
4. Don appropriate hearing protection.
5. With assistance, place the hood over the head and slip arms through the loops.
6. Have standby personnel connect the air line to the suit and the EAB manifold.
7. Adjust the hood so the bottom edge of the frame is out of the line of vision.
8. Adjust the cool-flow tube bypass flow control knob to provide maximum comfort and maintain adequate air flow to the suit.

NOTE

The bypass control knob controls the amount of air that is bled to atmosphere from the suit's supply air. Increasing the bypass flow decreases the temperature of the air supplied to the suit but also reduces the suit's internal air flow. The comfort of the suit depends on a balance between the internal flow rate and air temperature.

077-5.2.4 PRECAUTIONS. The following precautions are provided for the safety of personnel using steam suits:

1. While wearing a steam suit, avoid exposure to direct contact with flames or hot metal.
2. One steam suit may tax the ability of an EAB manifold and 1/4-inch air supply piping to supply enough air volume to maintain the steam suit inflated. Attaching additional EAB's, air operated equipment, or steam suits to the same EAB manifold or other EAB manifolds supplied by the same 1/4-inch air supply piping decreases the performance of the suit and should not be done.
3. The steam suit is worn with a 25-foot EAB hose to allow mobility in the space without having to disconnect the suit from the EAB manifold. If the steam suit is disconnected from the EAB manifold, the cooling effect of the air entering the suit will be lost and the suit may collapse. Wearer motion could then allow steam to enter the suit through openings without positive closure, i.e., under cape of hood, potentially burning the wearer.
4. The firefighting chemical Purple-K Powder (PKP) will damage aluminized surfaces. Avoid getting the chemical on the suit and rinse immediately if the chemical does get on the suit.

5. Avoid pointed or sharp objects to prevent puncturing or tearing the suit. Should a suit become torn, discard it.
6. Shipboard allowance includes a quantity of two suits which are to be used for training purposes only. Positively identify these suits with a large red X and stow in containers marked **FOR TRAINING PURPOSES ONLY** . Paint these containers yellow, and stow separately from the other suits to the maximum extent possible. Training suits can be used in an unlimited number of drills. However, limit handling of suits designated for real casualties to PMS maintenance procedures and actual emergency situations.
7. Do not make repairs to the steam suit. Should the aluminized material become damaged, replace the suit.
8. Do not use a damaged steam suit hood. Replace the hood.
9. Steam suits only provide limited personnel protection in steam environments at elevated temperatures. Reduce abnormal temperature and pressure in steam filled spaces as much as possible before entry.
10. Wear hearing protection when wearing a steam suit.
11. The air distribution hoses in the MSA steam suit are susceptible to crimping. A crimped hose can cut off the air supply to areas of the wearer's body, causing an increase in local skin temperature. Prior to donning the steam suit, ensure the air distribution hoses are not crimped.
12. To ensure proper cooling on the face, ensure the air distribution hose in the hood is arranged such that the holes in the hose are aimed down towards the face and across the faceplate.
13. The 25-foot EAB hose should be attached to an EAB manifold sufficiently distant from the steam leak if the steam leak results in a steam plume. This minimizes heating of the air supplied to the steam suit.
14. If entering an ambient steam environment, personnel should be briefed on required actions in order to minimize time spent in the steam environment. Additionally,
    a If possible, the affected space should be cooled to the maximum extent possible, using ship's ventilation systems, prior to entry into the space wearing the steam suit.
    b Personnel should adjust the Cool-Flo tube to maintain comfort. Personnel should also keeping moving so that the air inside the suit circulates, helping to cool the wearer.

077-5.2.5 STOWAGE. Stow the steam suit, the hood, and the fittings in separate plastic bags. The protective lens cover should be attached to the hood. Stow the entire suit in the original shipping container. This stowage procedure will prevent damage to the aluminized surface of the suit and makes the suit readily accessible for immediate use. Stow the entire suit in the original shipping container or as otherwise directed by NAVSEA.

077-5.2.6 MAINTENANCE OF THE STEAM SUIT. Perform maintenance on the steam suit after each use in accordance with PMS requirements.

REAR SECTION

NOTE

TECHNICAL MANUAL DEFICIENCY/EVALUATION EVALUATION REPORT (TMDER) Forms can be found at the bottom of the CD list of books. Click on the TMDER form to display the form.